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Takeuchi et al.

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(45) **Date of Patent: Dec. 29, 2015**

(54) **BOARD-TO-BOARD CONNECTOR WITH MATING INDICATING MEANS**

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H01R 4/26 (2006.01)
H01R 12/71 (2011.01)

(52) **U.S. Cl.**
CPC ***H01R 12/716*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 13/7036
USPC 439/489, 490, 188; 200/51.09
See application file for complete search history.

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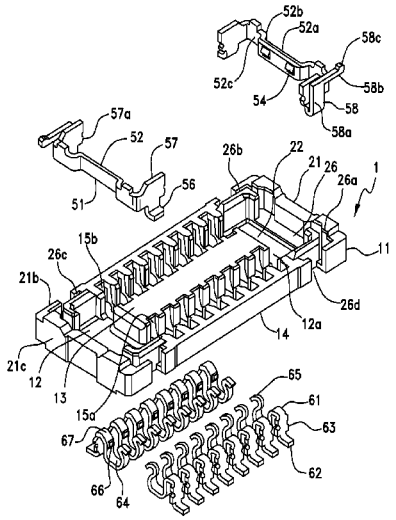
Primary Examiner — Neil Abrams

(57) **ABSTRACT**

A board-to-board connector comprises a first connector, a second connector and a switch. The first connector includes a first terminal and a first housing. The first housing includes a recessed portion and a first reinforcing bracket. The second connector includes a second terminal and a second housing. The second housing includes a raised portion and a second reinforcing bracket. The raised portion is insertable into the recessed portion. The switch detects the fit completion of the first connector and the second connector. The switch includes a plurality of switching members, each with the ability to contact another switching member. To signal mating, in one embodiment, an arm mounted on a bracket is pressed against a pad of a circuit board. In another embodiment, a contact portion on one housing contacts two members on the other housing. In another embodiment, the switch includes a connection between terminals disposed on each connector.

7 Claims, 16 Drawing Sheets



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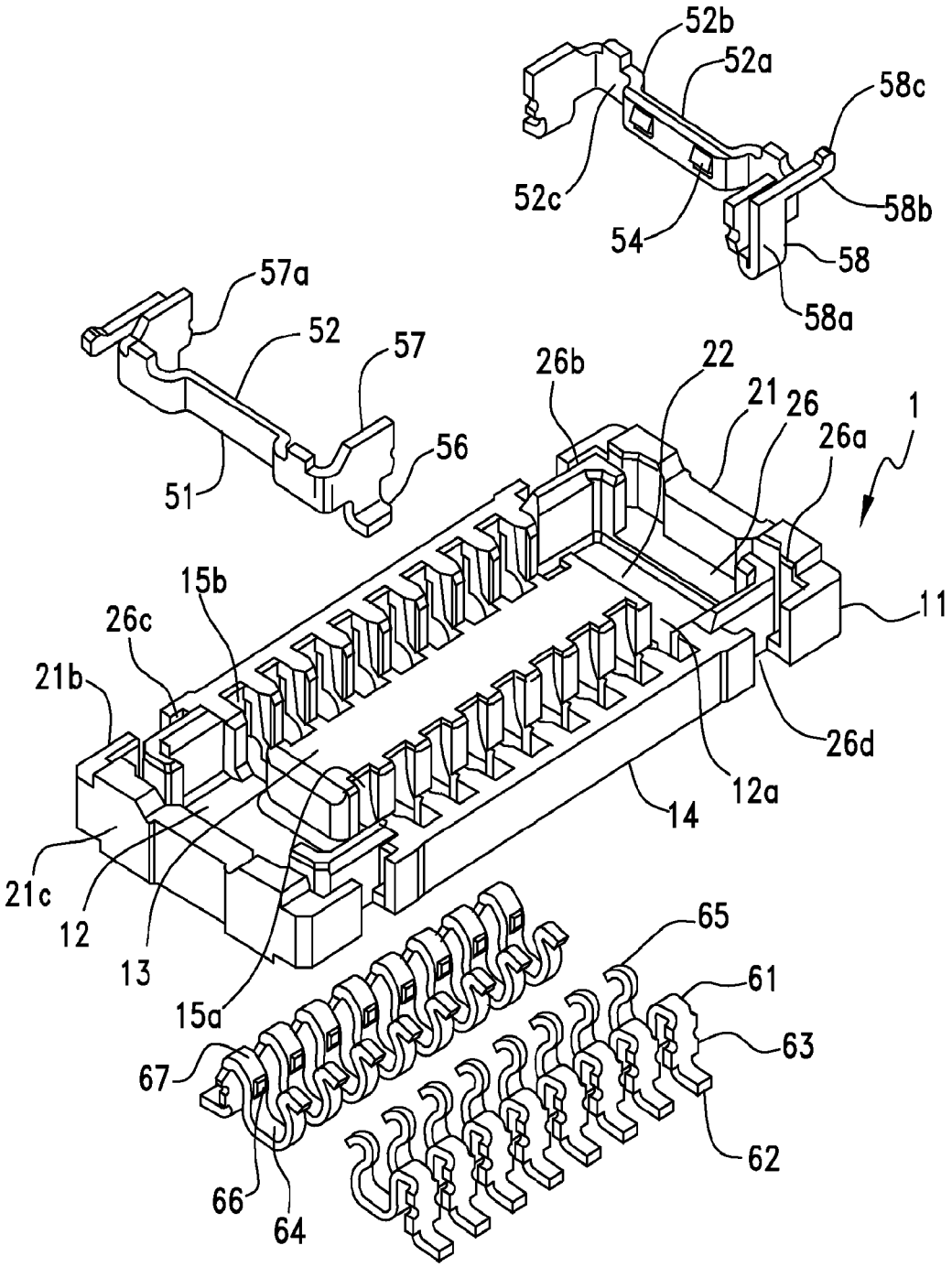
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52c
58b
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58
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51
15b
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15a
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61
67
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66
64

FIG.1

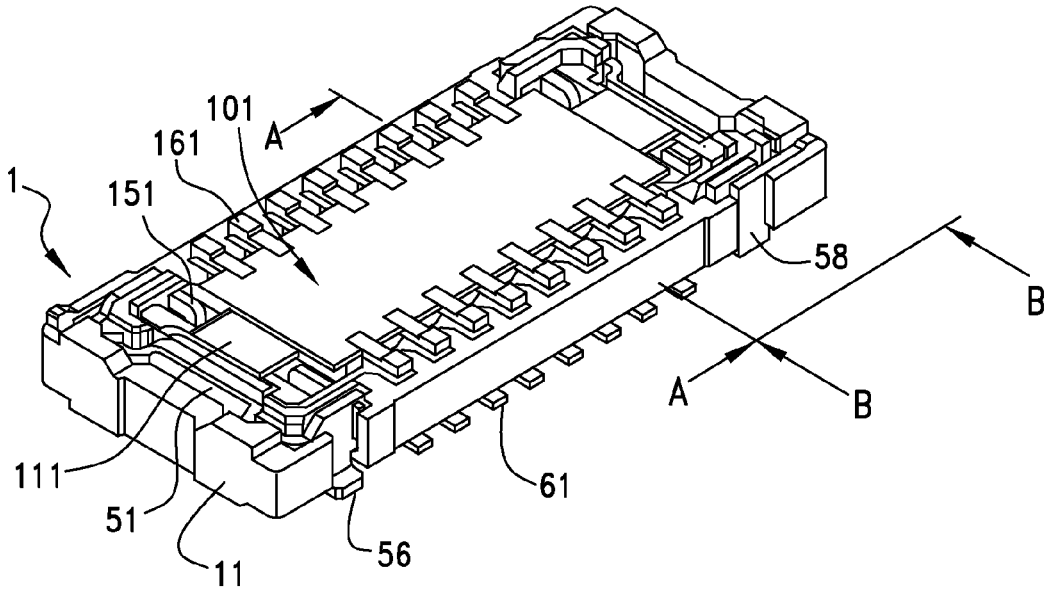
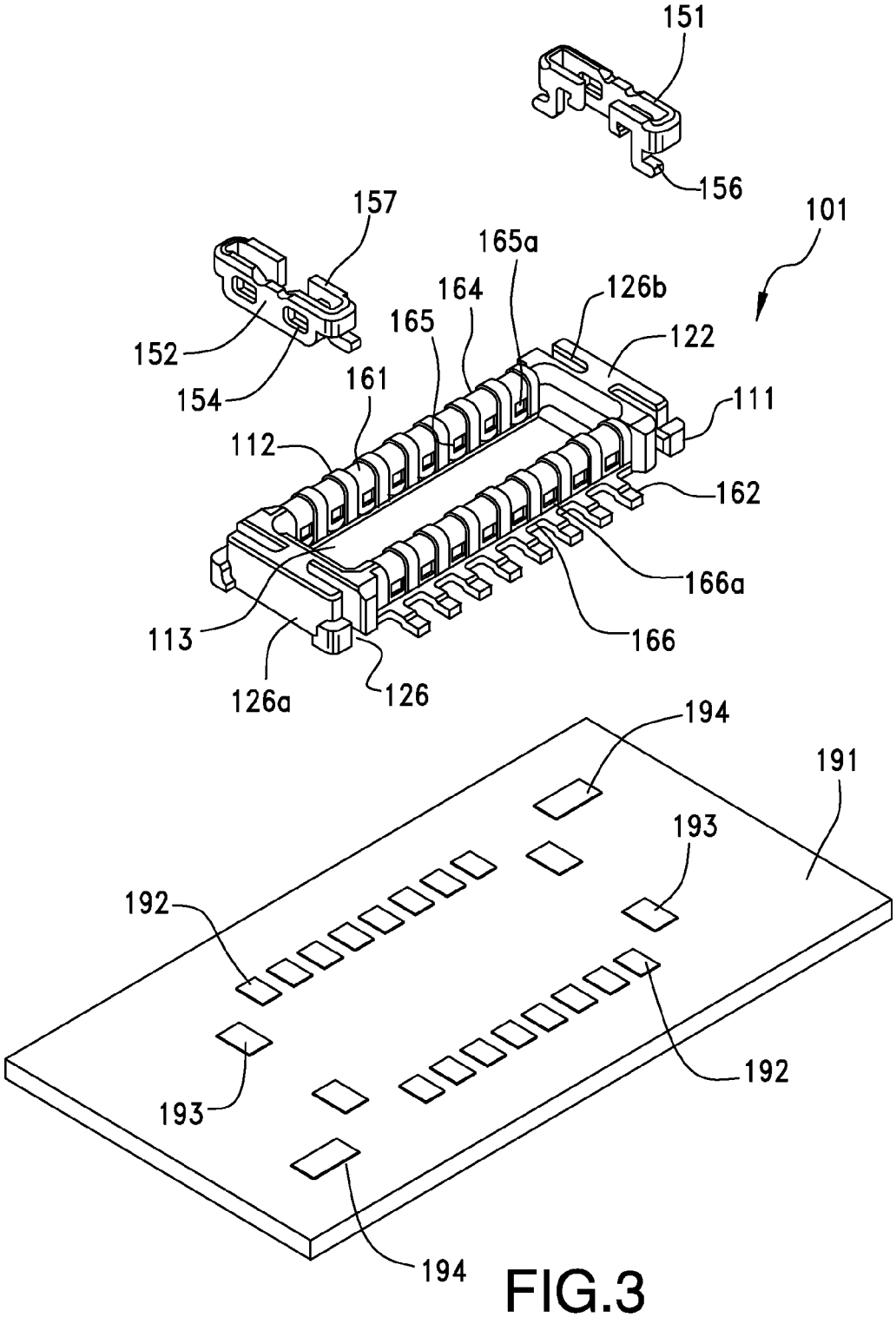


FIG.2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193
194

FIG.3

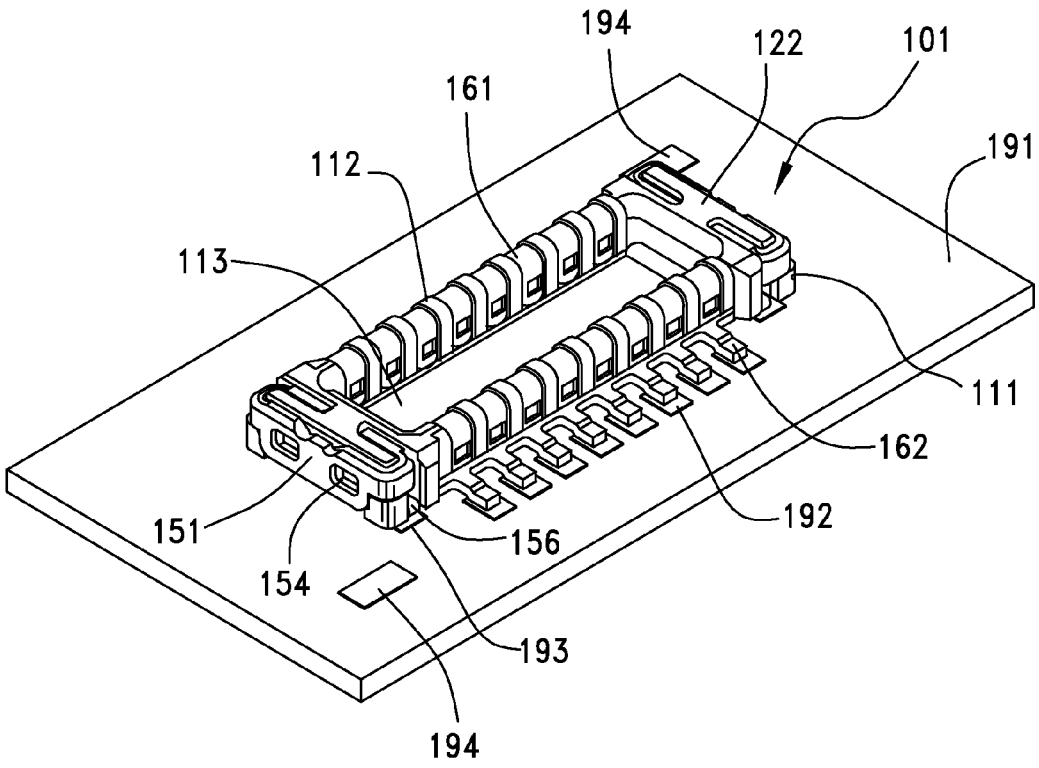
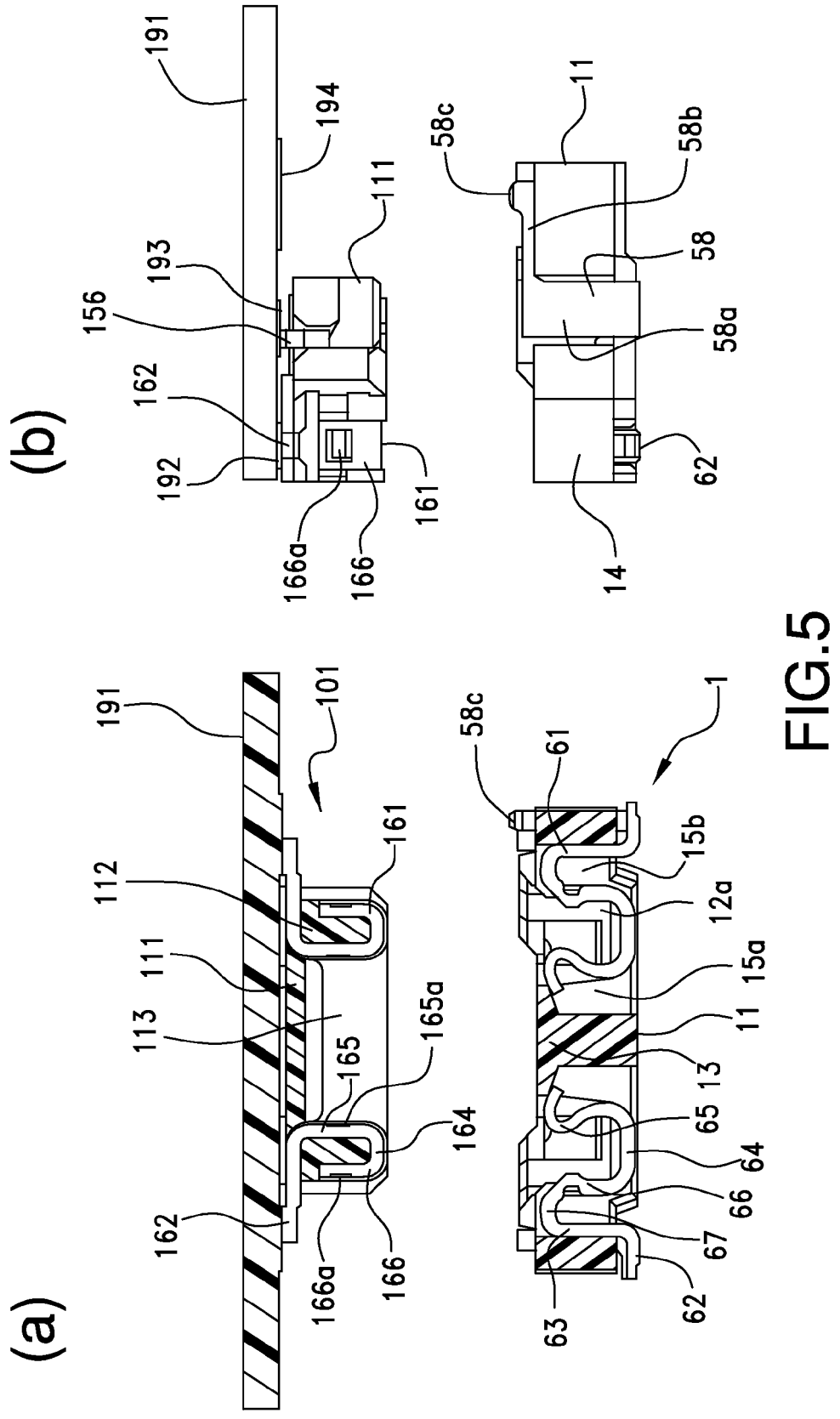


FIG.4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(a)
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101
161
112
111
113
165
165a
164
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58c
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12a
15a
11
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67
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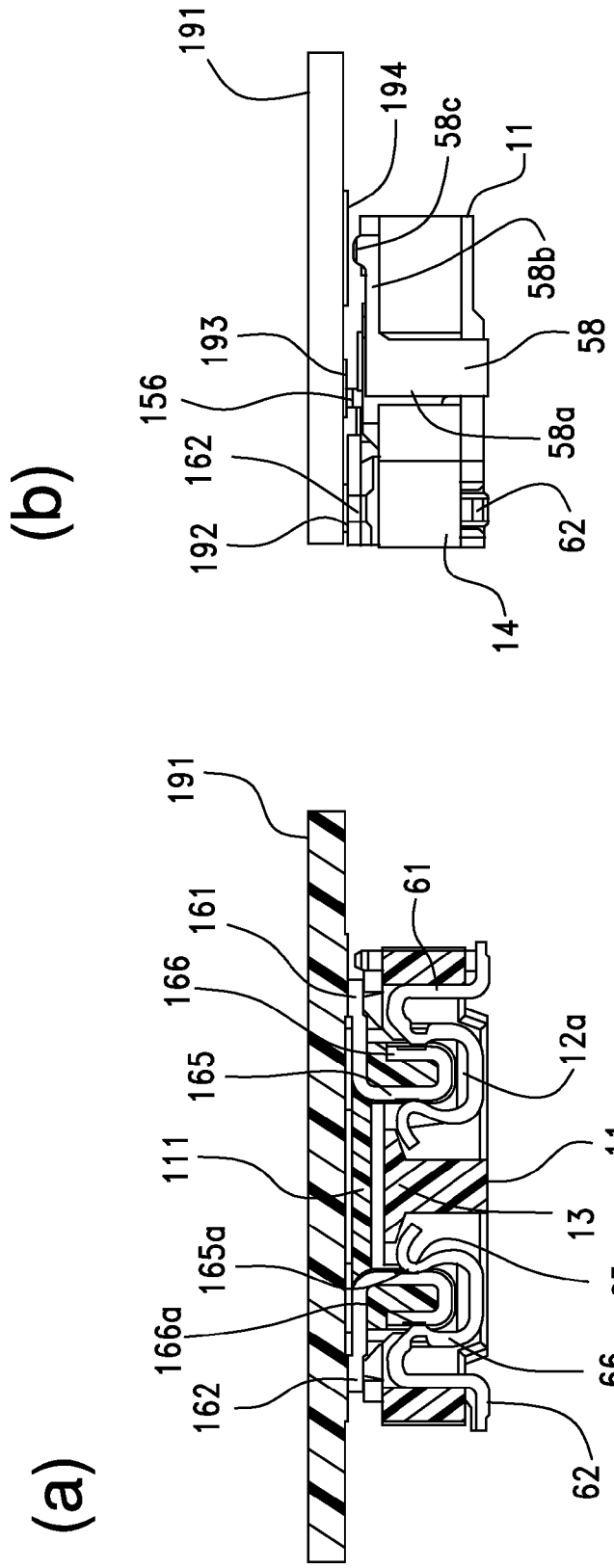
62

FIG.5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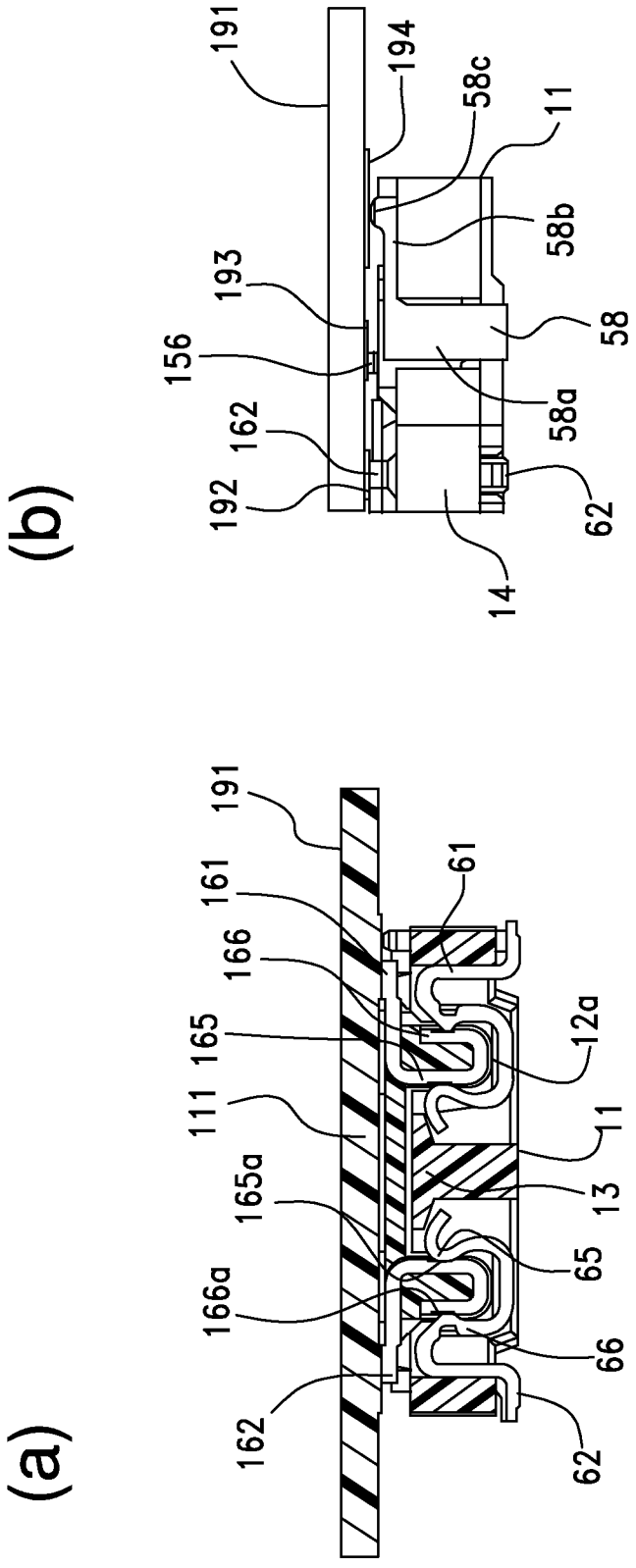
165a
65
166a
66
162
62

FIG.6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166a
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162
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FIG.7

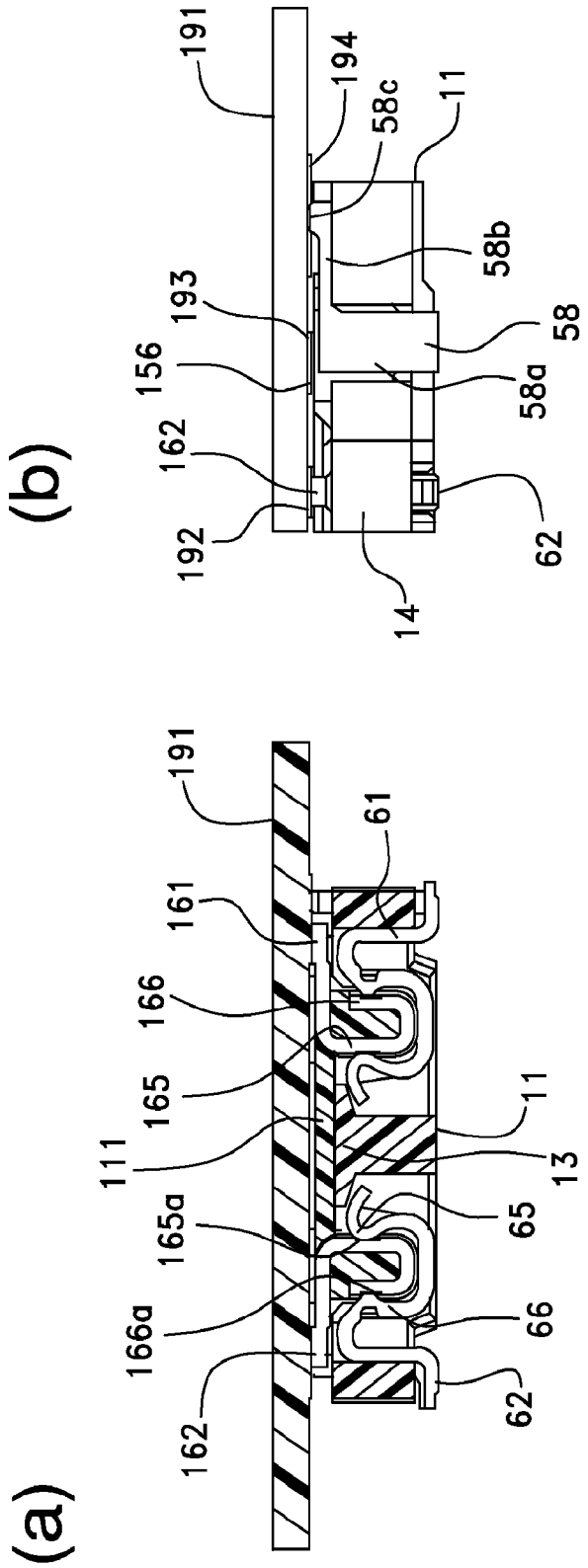
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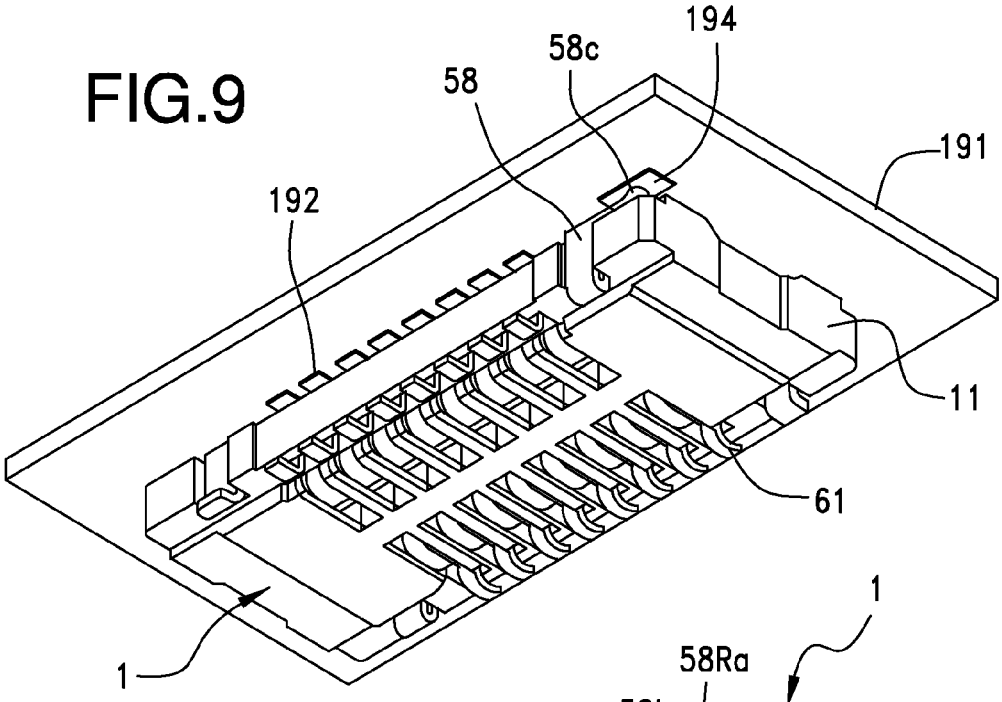
FIG.8

FIG.9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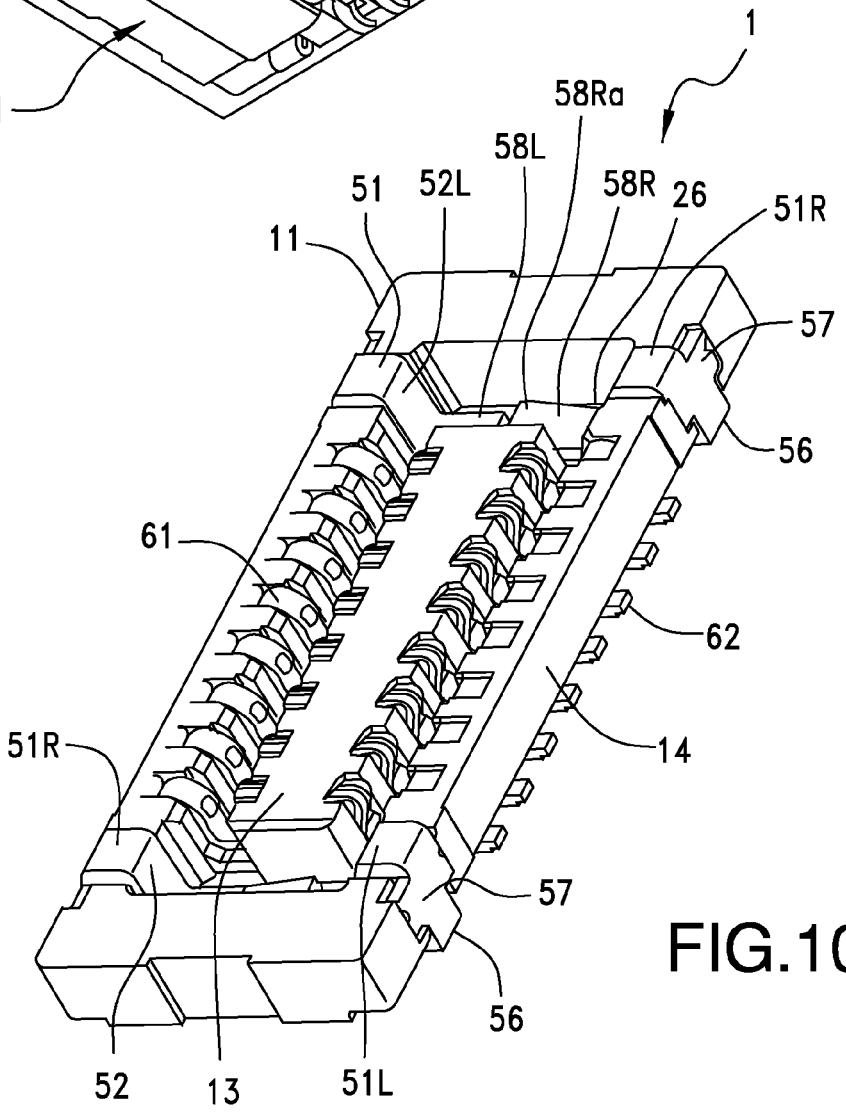
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FIG.10

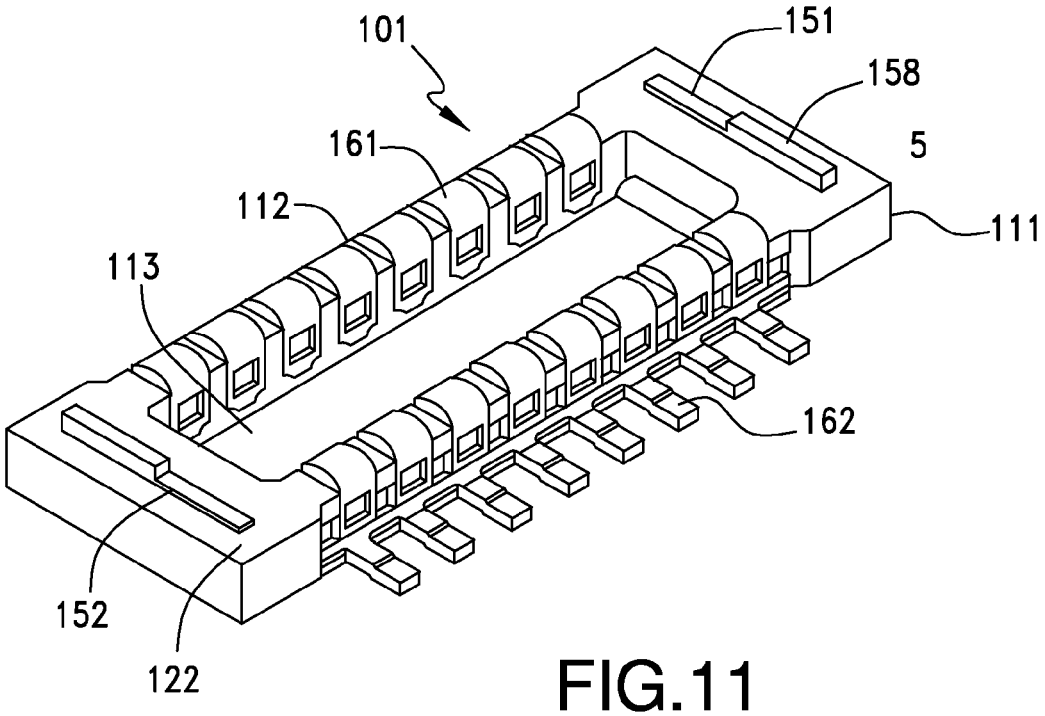
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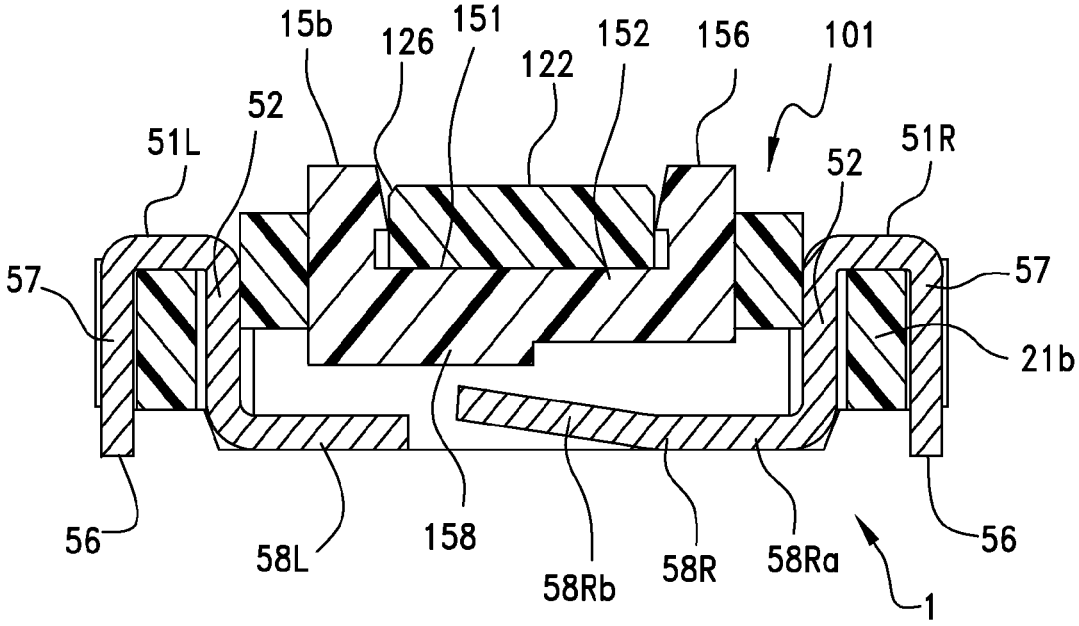
FIG.11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58R
58Ra
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FIG.12

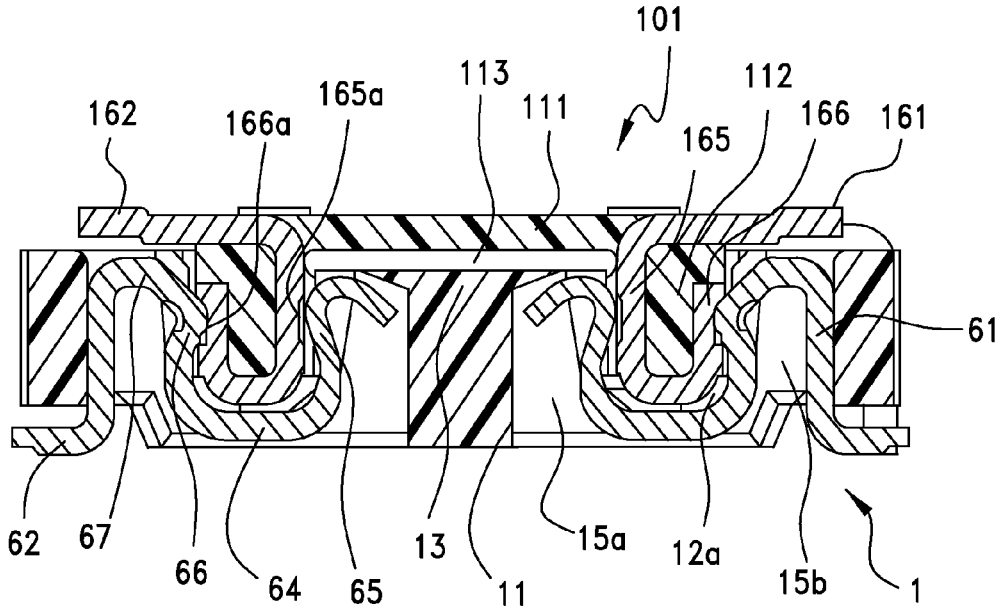
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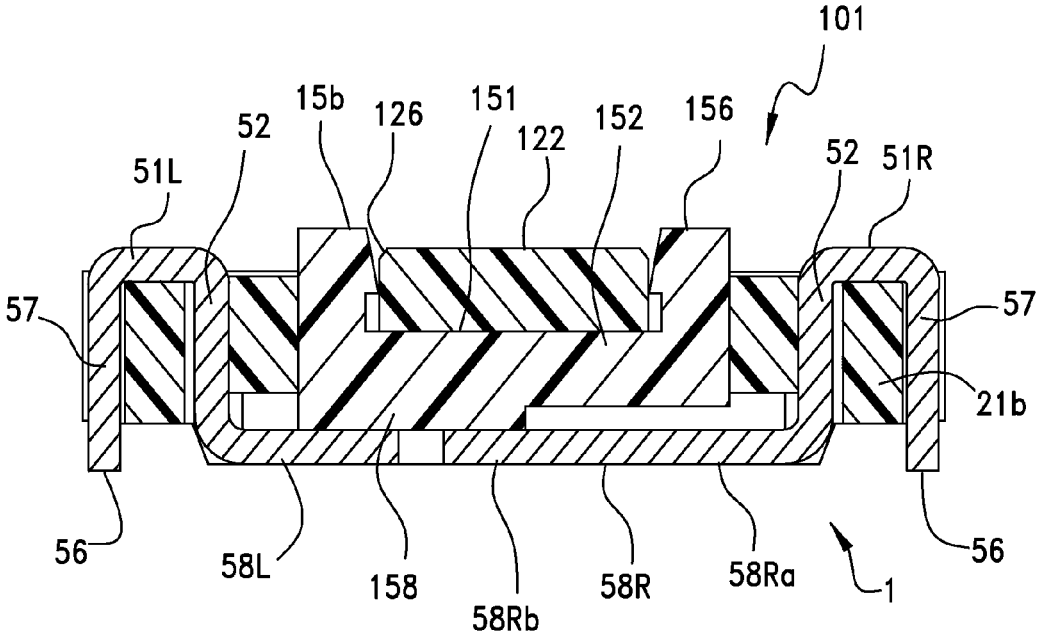
FIG.13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58Ra
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FIG.14

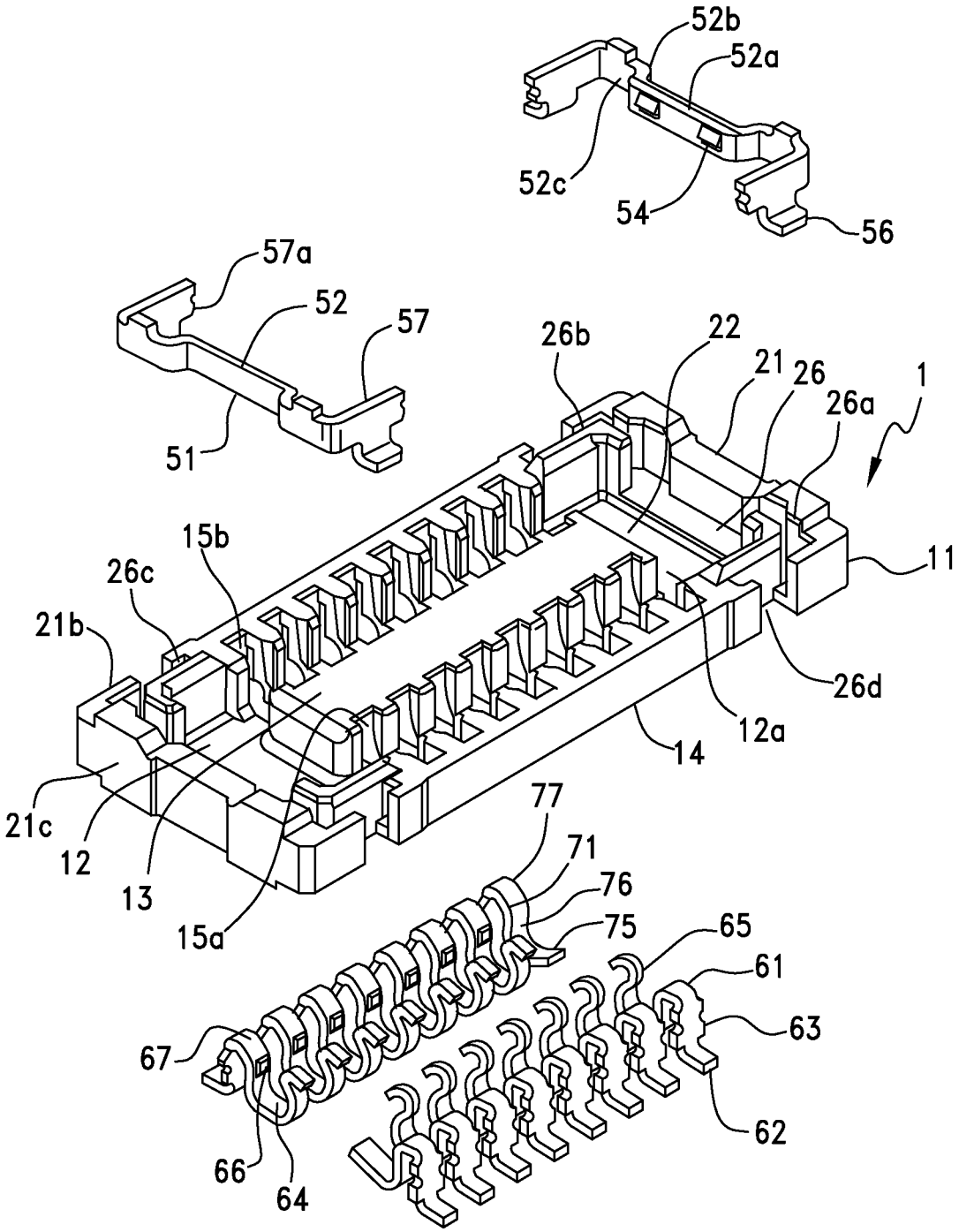
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FIG.15

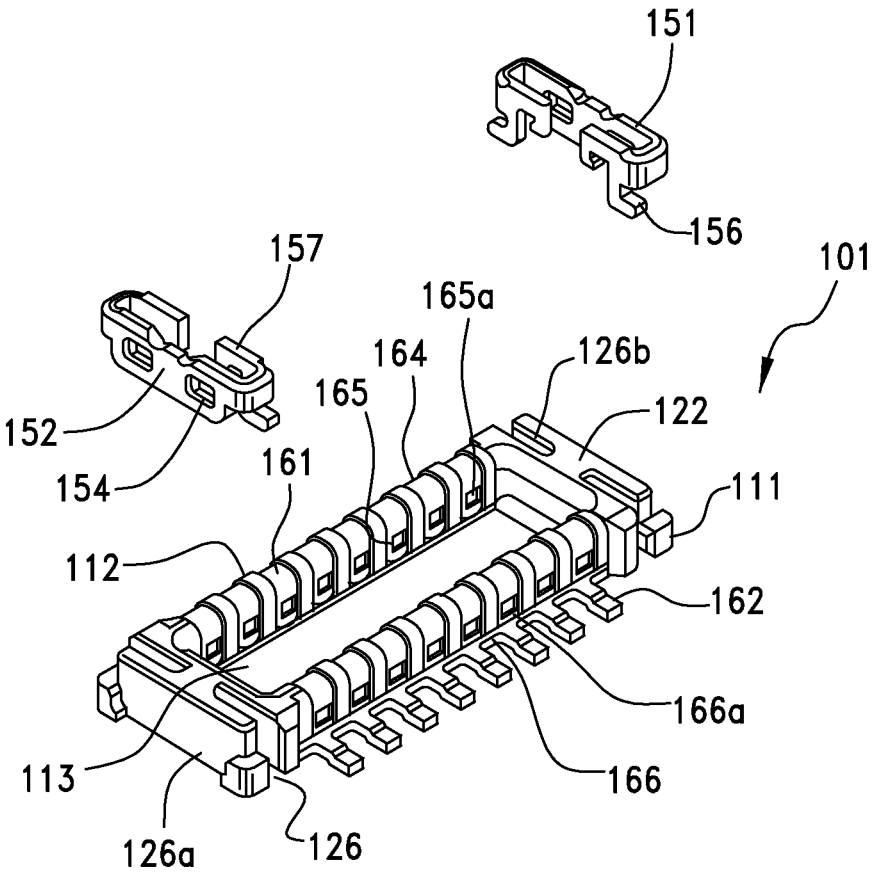
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FIG.16

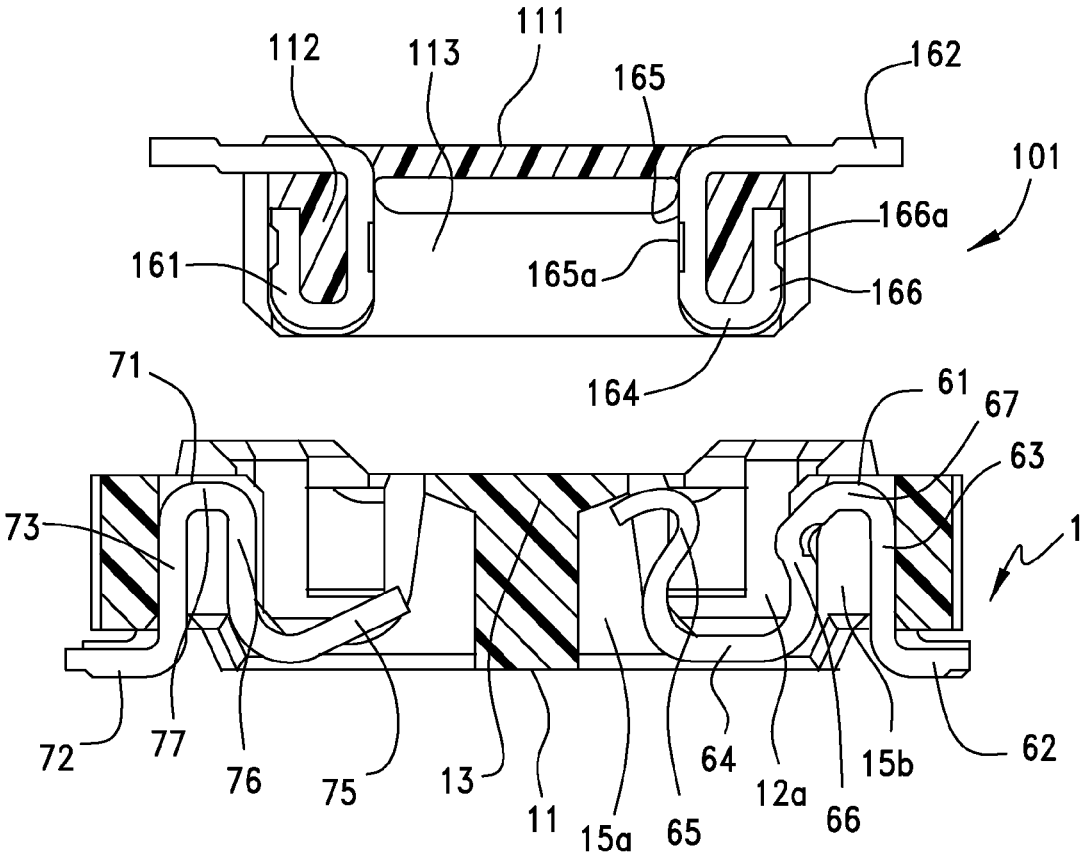
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FIG.17

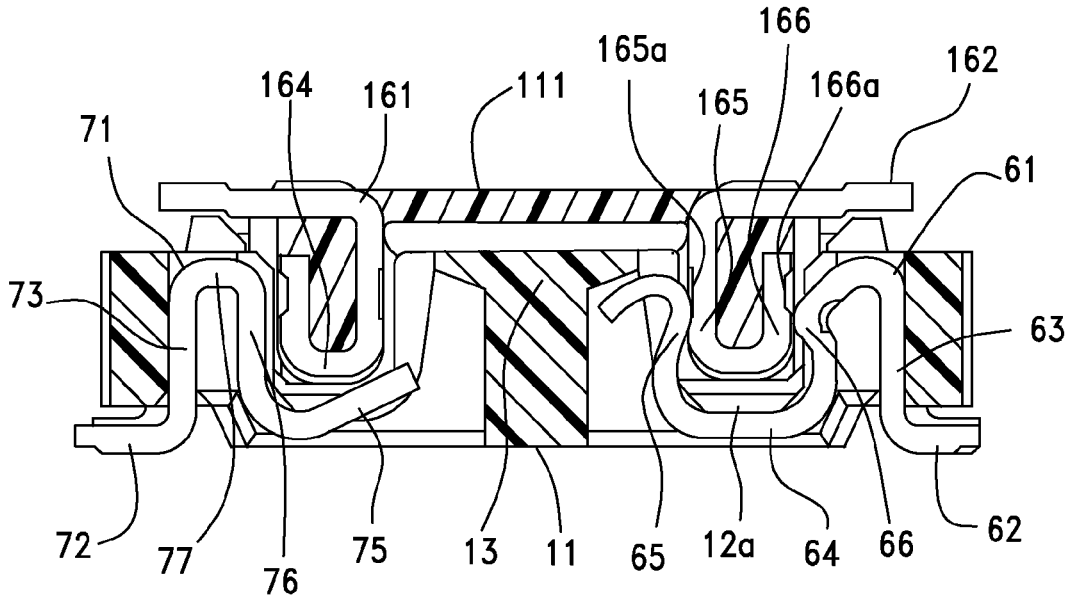
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FIG.18

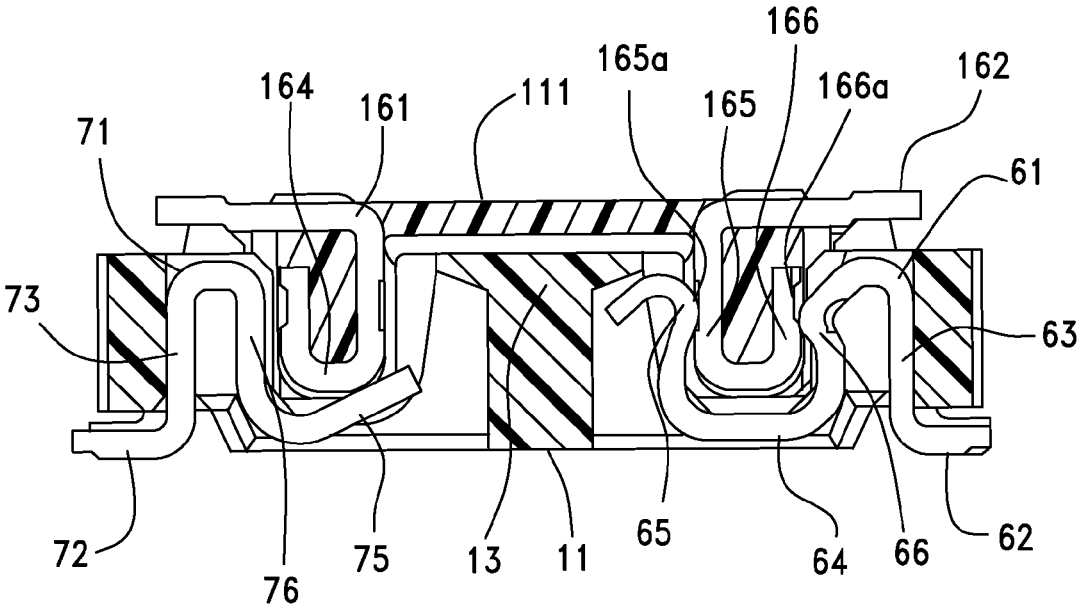
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FIG.19

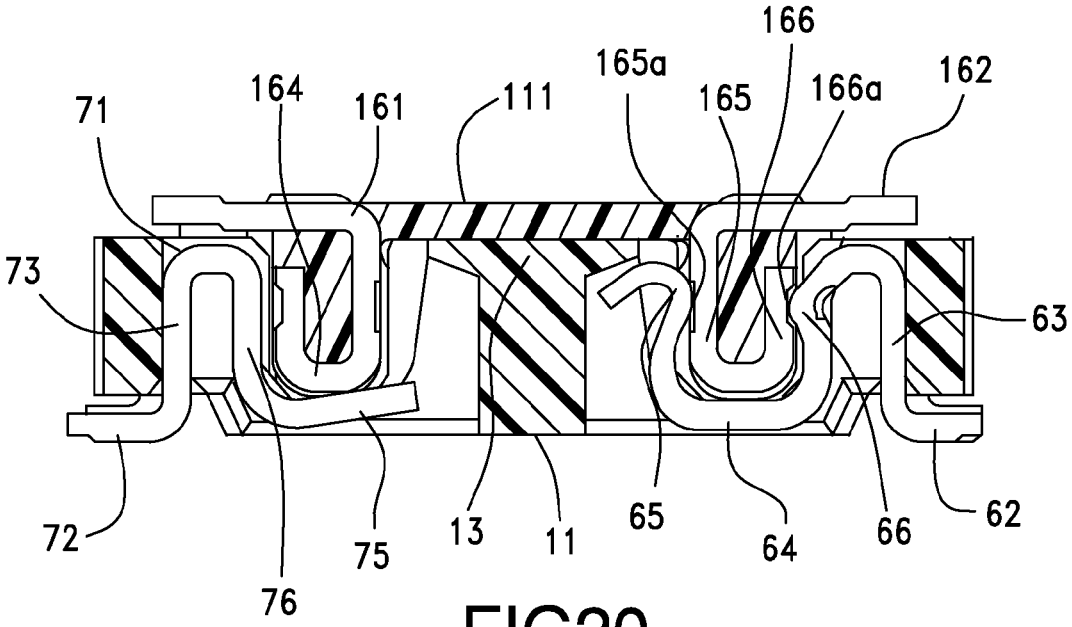
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FIG20

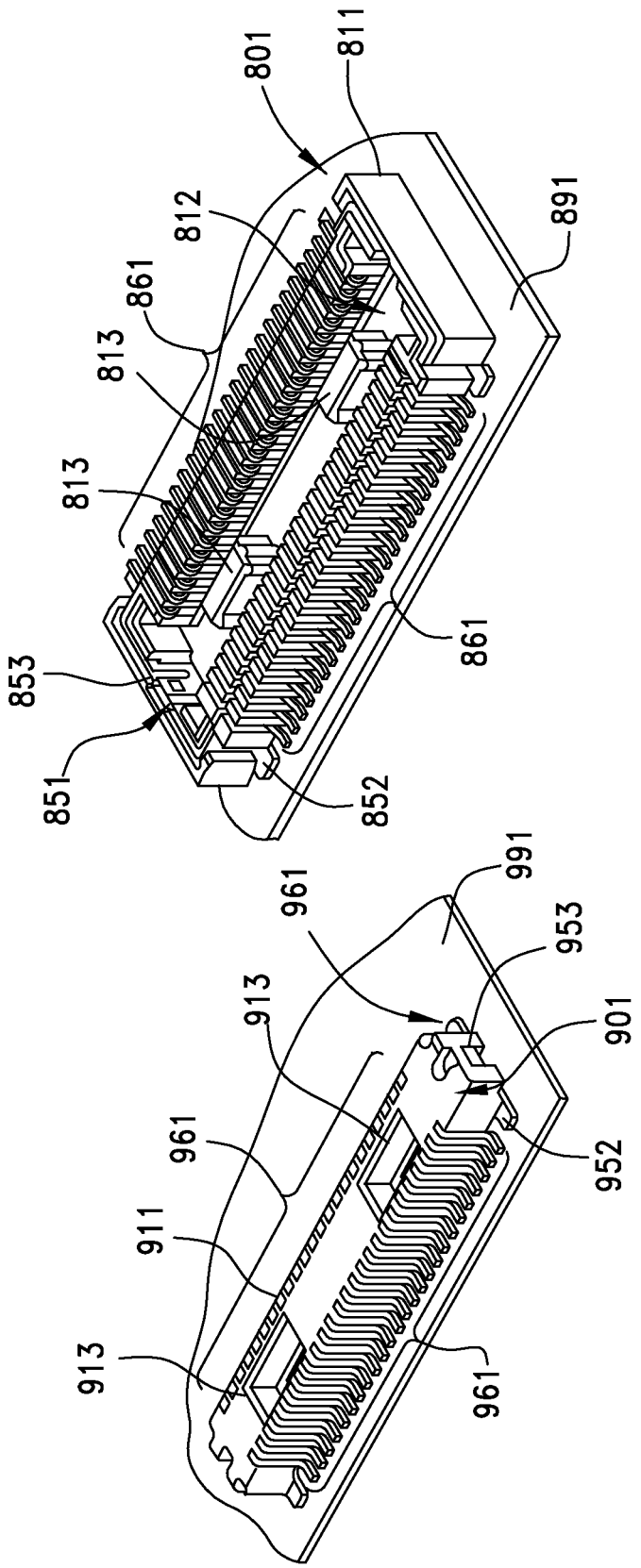

FIG.21
Prior art

BOARD-TO-BOARD CONNECTOR WITH MATING INDICATING MEANS

REFERENCE TO RELATED APPLICATIONS

The Present Disclosure claims priority to prior-filed Japanese Patent Application No. 2010-146047, entitled "Board-To-Board Connector," filed 28 Jun. 2010 with the Japanese Patent Office. The content of the aforementioned patent application is fully incorporated in its entirety herein.

BACKGROUND OF THE PRESENT DISCLOSURE

The Present Disclosure relates, generally, to a board-to-board connector. More particularly, the Present Disclosure relates to a board-to-board connector having a switch that electrically detects the fit completion of a first connector and a second connector.

Board-to-board connectors have been used conventionally to electrically connect a mutual pair of parallel circuit boards. Such board-to-board connectors are configured for conductivity by mutually fitting a pair of circuit boards by each attaching mutually facing surfaces. Further, technology has been proposed that holds the fitted state with the other connector with a reinforcing bracket attached to both end parts functioning as a locking member. An example is disclosed in Japanese Patent Application No. 2004-55306.

FIG. **21** is a perspective view illustrating the pre-fit state of a conventional board-to-board connector. Reference **801** in the drawing is the first connector which is one side of a pair of board-to-board connectors, and is mounted on the surface of the first board **891**. Further, reference **901** in the drawing is the second connector which is the other side of a pair of board-to-board connectors, and is mounted on the surface of the second board **991**. The first connector **801** includes a first housing **811**, and a plurality of first terminals **861** mounted on the first housing **811**, and the second connector **901** includes a second housing **911** and a plurality of second terminals **961** mounted on the second housing **911**. In addition, when the first connector **801** and the second connector **901** are fit together, the first board **891** and the second board **991** are electrically connected by the mutual contact between the corresponding first terminals **861** with the second terminals **961**.

A recessed part **812** is formed on the first housing **811** to receive the second housing **911** while an engaging raised part **813** is formed within the recessed part **812**. Meanwhile, an engaging recessed part **913** is formed on the second housing **911** to receive the engaging raised part **813**.

In addition, a first metal fitting **851** is attached to both ends in the long side direction of the first housing **811**. The first metal fitting **851** is provided with a first tail part **852** that is soldered to the surface of the first board **891**, and is also provided with a first locking projection **853** that protrudes. Additionally, a second metal fitting **951** is attached to both ends in the long side direction of the second housing **911**. The second metal fitting **951** is provided with a second tail part **952** that is soldered to the surface of the second board **991**, and is also provided with a second locking projection **953** that protrudes.

Further, when the first connector **801** and the second connector **901** are fit together, the engaging raised part **813** and the engaging recessed part **913** are mutually engaged while the first locking projection **853** of the first metal fitting **851** and the second locking projection **953** of the second metal fitting **951** are mutually engaged. By so doing the first connector **801** and the second connector **901** are locked together and are held by a fitted state.

Moreover, at the time of fitting, either one of the first connector **801** or the second connector **901** is vertically inverted from the disposition illustrated in the drawing so as to fit with the other connector.

SUMMARY OF THE PRESENT DISCLOSURE

However, with the conventional board-to-board connector, it is difficult to confirm whether the first connector **801** and the second connector **901** are completely fit. That is to say that because either one of the first connector **801** or the second connector **901** is vertically inversed at the time of fitting and the second housing **911** is received into the recessed part **812** of the first housing **811**, visual confirmation from the outside cannot be made to confirm whether the first locking projection **853** of the first metal fitting **851** positioned on the inner side of the recessed part **812** is engaged with the second locking projection **953** of the second metal fitting **951** that is attached to the second housing **911**.

Reasonably, if there is a large degree of projection by the second housing **911** from the top end of the first housing **811**, a determination can be made visually whether the fit of the first connector **801** and the second connector **901** is incomplete. However, because the first board **891** and the second board **991** which have significantly larger surface areas than the bottom surfaces of the first housing **811** and the second housing **911**, are attached to the bottom surface of the first housing **811** and the second housing **911**, visual confirmation of the degree of projection by the second housing **911** from the top end of the first housing **811** is difficult.

Particularly, due to advancements in smaller and low height board-to-board connectors in recent years, making an accurate visual confirmation of the degree of projection by the second housing **911** from the top end of the first housing **811**, and making an accurate determination whether the first connector **801** and the second connector **901** are completely fixed has become extremely difficult.

An object of the Present Disclosure, in solving the problem of the conventional board-to-board connector, is to provide a board-to-board connector that can accurately confirm fit completion with high reliability for the first connector and the second connector even in a fitting process of a small size and low height board-to-board connector by electrically detecting the fit completion of the first connector and second connector, and can securely prevent the occurrence of incomplete fitting in a fitting process.

Therefore, the board-to-board connector of the Present Disclosure includes a first connector having a first terminal and a first housing provided with a recessed part, a second connector having a second terminal that contacts the first terminal and a second housing provided with a raised part that inserts into the recessed part, wherein a switch is provided that electrically detects the fit completion of the first connector and the second connector.

With another board-to-board connector of the Present Disclosure, further, the first connector has a first reinforcing bracket equipped on the first housing, the second connector has a second reinforcing bracket equipped on the second housing, and the switch includes a plurality of switching members with the ability to mutually contact and at least one of the switching members is the first reinforcing bracket or the second reinforcing bracket.

With another board-to-board connector of the Present Disclosure, further, at least one of the switching members can flexibly displace in the fit direction of the first connector and the second connector.

With still another board-to-board connector of the Present Disclosure, further, at least one of the switching members functions as a stop to prevent more than necessary relative displacement in the fit direction of the first connector and the second connector.

With still another board-to-board connector of the Present Disclosure, further, one of either the first terminal or second terminal is provided with a contacting recessed part and the other is provided with a contacting raised part, and when the contacting recessed part and the contacting raised part engage, the switch detects the fit completion of the first connector and the second connector.

According to the Present Disclosure, the board-to-board connector electrically detects the fit completion of the first connector and the second connector. By so doing, fit completion of the first connector and the second connector can be accurately confirmed even in a fitting process of a small size and low height board-to-board connector, and the occurrence of incomplete fitting can be securely prevented in the fitting process thereby increasing reliability.

BRIEF DESCRIPTION OF THE FIGURES

The organization and manner of the structure and operation of the Present Disclosure, together with further objects and advantages thereof, may best be understood by reference to the following Detailed Description, taken in connection with the accompanying Figures, wherein like reference numerals identify like elements, and in which:

FIG. **1** is an exploded view, seen from the fitting surface side, of a first connector according to the first embodiment of the Present Disclosure;

FIG. **2** is a perspective view, illustrating the fitting of the first connector and a second connector, as seen from the view of FIG. **1**;

FIG. **3** is an exploded view, seen from the fitting surface side, of the second connector and second board according to the first embodiment of the Present Disclosure;

FIG. **4** is a perspective view, seen from the fitting surface side of the second connector mounted on the surface, of the second board of FIG. **3**;

FIG. **5** illustrates the first step of the fitting process of the board-to-board connector according to the first embodiment of the Present Disclosure, where FIG. **5**(*a*) is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and FIG. **5**(*b*) is a side plane view corresponding to the visual portion of Arrows B-B in FIG. **2**;

FIG. **6** illustrates the second step of the fitting process, where FIG. **6**(*a*) is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and FIG. **6**(*b*) is a side plane view corresponding to the visual portion of Arrows B-B in FIG. **2**;

FIG. **7** illustrates the third step of the fitting process, where FIG. **7**(*a*) is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and FIG. **7**(*b*) is a side plane view corresponding to the visual portion of Arrows B-B in FIG. **2**;

FIG. **8** illustrates the fourth step of the fitting process, where FIG. **8**(*a*) is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and FIG. **8**(*b*) is a side plane view corresponding to the visual portion of Arrows B-B in FIG. **2**;

FIG. **9** is a perspective view illustrating the completion of the fitting process, seen from the fitting surface side of the first connector of FIG. **1**;

FIG. **10** is a perspective view, seen from the fitting surface side of a first connector according to the second embodiment of the Present Disclosure;

FIG. **11** is a perspective view, seen from the fitting surface side of a second connector according to the second embodiment of the Present Disclosure;

FIG. **12**, which illustrates a mid-way step in the fitting process of the board-to-board connector, is a cross-sectional view illustrating the relationship of a first reinforcing bracket and a second reinforcing bracket according to the second embodiment of the Present Disclosure;

FIG. **13**, which illustrates the completion of the fitting process, is a cross-sectional view illustrating the relationship of first terminals and second terminals according to the second embodiment of the Present Disclosure;

FIG. **14** is a cross-sectional view illustrating the relationship of the first reinforcing bracket and the second reinforcing bracket of FIG. **12**, in the completion stage of FIG. **13**;

FIG. **15** is an exploded view, seen from the fitting surface side, of a first connector according to the third embodiment of the Present Disclosure;

FIG. **16** is an exploded view, seen from the fitting surface side, of a second connector according to the second embodiment of the Present Disclosure;

FIG. **17**, which illustrates the step of the fitting process of FIG. **5**, is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and illustrates the relationship between the fit completion detecting terminal and the second terminal;

FIG. **18**, which illustrates the step of the fitting process of FIG. **6**, is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and illustrates the relationship between the fit completion detecting terminal and the second terminal;

FIG. **19**, which illustrates the step of the fitting process of FIG. **7**, is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **3** and illustrates the relationship between the fit completion detecting terminal and the second terminal;

FIG. **20**, which illustrates the state of the fitting process of FIG. **9**, is a cross-sectional view corresponding to the visual portion of Arrows A-A in FIG. **2** and illustrates the relationship between the fit completion detecting terminal and the second terminal; and

FIG. **21** is a perspective view illustrating the pre-fit state of a conventional board-to-board connector.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the Present Disclosure may be susceptible to embodiment in different forms, there is shown in the Figures, and will be described herein in detail, specific embodiments, with the understanding that the disclosure is to be considered an exemplification of the principles of the Present Disclosure, and is not intended to limit the Present Disclosure to that as illustrated.

In the embodiments illustrated in the Figures, representations of directions such as up, down, left, right, front and rear, used for explaining the structure and movement of the various elements of the Present Disclosure, are not absolute, but relative. These representations are appropriate when the elements are in the position shown in the Figures. If the descrip-

tion of the position of the elements changes, however, these representations are to be changed accordingly.

Referring to the Figures generally, and in particular FIGS. **1-2**, **1** is the first connector as one side of a pair of board-to-board connectors according to the present embodiment, and is a surface mount type connector mounted on the surface of the first board not illustrated. Furthermore, **101** is the second connector as the other side of a pair of board-to-board connectors according to the present embodiment, and is a surface mount type connector mounted on the surface of the second board **191** to be described hereinafter. The board-to-board connector according to the present embodiment includes the first connector **1** and a second connector **101**, and electrically connects the first board and the second board **191**. Moreover, the first board and the second board **191** can be any type of board including, for example, a printed circuit board used in electronic devices or the like, such as, a flexible flat cable (FFC), a flexible printed circuit (FPC), or the like.

Further, the first connector **1** includes a first housing **11** as a connector main body that is integrally formed by an insulating material such as a synthetic resin or the like. The first housing **11**, as illustrated in the drawing, is provided with an essentially rectangular thick board shape that is essentially a rectangular solid, and a recessed part **12** having an essentially rectangular shape is formed around the periphery on the side where the second connector **101** engages, in other words, on the fitting surface side (top side in the drawing). The connector **1** is provided with dimensions such as approximately 10.0 mm long, approximately 2.5 mm wide, and approximately 1.0 mm thick, and these dimensions can be suitably changed. Further, a first ridged part **13** is integrally formed with the first housing **11** as an island part within the recessed part **12**, and a side wall part **14** is integrally formed with the first housing **11** to extend in parallel with the first ridged part **13** on both sides of the first ridged part **13**. In this case, the first ridged part **13** and the side wall part **14** protrude upward from the bottom surface of the recessed part **12** and extend in the long side direction of the first housing **11**. By so doing, a recessed groove part **12***a*, that is a long and narrow recessed part, is formed between the first ridged part **13** and the side wall part **14** so as to extend in the long side direction of the first housing **11** as a part of the recessed part **12** on both sides of the first ridged part **13**. Moreover, in the example illustrated in the drawings, there is only one first ridged part **13**, but there may also be a plurality thereof, and there may be any number of these. In addition, the first ridged part **13** is provided with a dimension of, for example, 0.6 mm in width, and this dimension can be suitably changed.

Here, a first terminal receptacle inner side cavity **15***a* is formed in a recessed groove shape to the side surface of both sides of the first ridged part **13**. Further, a first terminal receptacle outer side cavity **15***b* is formed in a recessed groove shape to the side surface of the inner side of the side wall part **14**. Additionally, because the first terminal receptacle inner side cavity **15***a* and the first terminal receptacle outer side cavity **15***b* are mutually integrated and joined at the bottom part of the recessed groove part **12***a*, when describing the first terminal receptacle inner side cavity **15***a* and the first terminal receptacle outer side cavity **15***b*, it will be referred to integrally as the first terminal receptacle cavity **15**.

The first terminal receptacle cavity **15** is formed in, for example, eight pieces each at a pitch of approximately 0.4 mm to both sides of the first ridged part **13**. Further, the first terminal **61** received into each of the first terminal receptacle cavities **15** is also arranged in, for example, eight pieces each at a pitch of approximately 0.4 mm to both sides of the first ridged part **13**. Note, the pitch and number of first terminal receptacle cavities **15** can be suitably changed.

The first terminal **61** is a member integrally formed by a working process such as stamping or bending a conductive metal plate, and is provided with a retention receiving part **63**, a tail part **62** that is connected to the lower end of the retention receiving part **63**, an upper side connecting part **67** that is connected to the upper end of the retention receiving part **63**, a second contacting part **66** as a second contacting raised part that is formed in the vicinity of the inner end of the upper side connecting part **67**, a lower side connecting part **64** that is connected to the second contacting part **66**, and a first contacting part **65** as a first contacting raised part that is formed in the vicinity of the free end of the lower side connecting part **64**.

Further, the retention receiving part **63** extends in a vertical direction, that is to say the thickness direction, of the first housing **11** and is a part that is engaged and held with the first terminal receptacle outer side cavity **15***b*. In addition, the tail part **62** is connected by bending in relation to the retention receiving part **63**, and extends outward in the lateral direction, that is to say the width direction, of the first housing **11**, and is connected by soldering or the like to a terminal connection pad that is linked to a conductive trace on the first board. Furthermore, the upper side connecting part **67** is connected by bending in relation to the retention receiving part **63** and extends inward in the width direction of the first housing **11**.

The curved second contacting part **66** is bent facing downward to the inner direction of the upper side connecting part **67** and is formed to protrude inward in the width direction of the first housing **11**. Further, the lower side connecting part **64** is a part provided with a U shaped side surface shape that is connected to the lower end of the second contacting part **66**. The curved first contacting part **65** is bent in a U shape in the vicinity of the free end, that is to say, the upper end of the inner side, of the lower side connecting part **64** and is formed to protrude outward in the width direction of the first housing **11**.

The first terminal **61** is inserted into the first terminal receptacle cavity **15** from the mounting surface side (lower side in the drawing), and is anchored to the first housing **11** by being held from both sides by the side walls of the first terminal receptacle outer side cavities **15***b* where the retention receiving part **63** is formed to the side surface of the inner side of the side wall part **14**. In this state, in other words the state in which the first terminal **61** is loaded on the first housing **11**, the first contacting part **65** and the second contacting part **66** are positioned on both the left and right sides of the recessed groove part **12***a* so as to face each other.

Moreover, the first terminal **61** is a member that is integrally formed by a working process of a metal plate and therefore has a certain amount of flexibility. As is evident from its shape, there is the possibility of flexible deformation in the gap between the mutually facing first contacting part **65** and the second contacting part **66**. In other words, when the second terminal **161** of the second connector **101** is inserted between the first contacting part **65** and a second contacting part **66**, by so doing, the gap between the first contacting part **65** and the second contacting part **66** flexibly elongates.

In addition, first overhanging end parts **21** are each arranged as first engaging guide parts to both ends in the long side direction of the first housing **11**. Each first overhanging end part **21** has an overhanging end recessed part **22** formed as a part of the recessed part **12**. The overhanging end recessed part **12** is a nearly rectangular shaped recessed part that is connected to both ends in the long side direction of each recessed groove part **12***a*. Further, the overhanging end

part **22** functions as an inserting recessed part when the second overhanging end part **122**, to be described hereinafter provided by the second connector **101**, is inserted and when the first connector **1** and the second connector **101** are in a fitted state.

In addition, the first overhanging end part **21** is provided with a side wall extending part **21***b* that extends in the long side direction of the first housing **11** from both sides in the long side direction of the side wall part **14**, and an end wall part **21***c* that extends in the short side direction of the first housing **11** and is connected to the side wall extending part **21***b* on both ends. With every first overhanging end, the end wall part **21***c* and the side wall extending part **21***b* connected to both ends thereof, form a side wall in the form of a continuous C shape and mark three directions of the nearly rectangular shaped overhanging end recessed part **22**.

Furthermore, a first reinforcing bracket **51** is attached as a reinforcing metal fitting to the first overhanging end part **21**. The first reinforcing bracket **51** is arranged to the outer side in the long side direction of the first housing **11** for the overhanging end recessed part **22** and is received and held within the first metal fitting retention recessed part **26** formed on the first overhanging end part **21**.

The first reinforcing bracket **51** in the present embodiment is a member that is integrally formed by a working process such as punching or bending a conductive metal plate and is provided with a first main body part **52** in the shape of a long and narrow band that extends in the width direction of the first housing **11** as a complete body, a first arm part **57** that is connected by bending to both the left and right ends of the first main body part **52** and extends in the long side direction of the first housing **11** and is held to the first housing **11**, a first board connecting part **56** that is connected to the bottom end of the first arm part **57** of one end, a fit completion detecting part **58** connected to the bottom end of the first arm part **57** of the other end, and a first locking part **54** that is formed on the first main body part **52**.

Further, the first main body part **52** is provided with a center part **52***a* that extends linearly in the width direction of the first housing **11** as viewed from the insert and release direction, that is to say the vertical direction, of the first connector **1** and the second connector **101**, a bending part **52***b* that bends so as to form a crank shape as viewed from the vertical direction and is attached to both ends of the center part **52**, and an outer side end part **52***c* that extends linearly in the width direction of the first housing **11** as viewed from the vertical direction and extends out in the width direction of the first housing **11** from the bending part **52***b*.

In addition, the first arm part **57** extends toward the center in the long side direction of the first housing **11** from the outer side end of the outer side end part **52***c*, and is provided with a first lock latching part **57***a* in a raised and recessed shape at the free ends thereof.

Further, the first board connecting part **56** is connected to the lower end of one side of the first armed part **57** and is connected by bending so that the free ends thereof face the outer side in the width direction of the first housing **11**. The first board connecting part **56** functions as a soldering tail part for the first reinforcing bracket **51**, and the bottom surface thereof is formed so as to be nearly parallel with the mounting surface not illustrated of the first housing **11** and is anchored by soldering or the like to an anchoring pad on the first board.

Further, a main body part **58***a* of the fit completion detecting part **58** is connected to the lower end of the other end of the first arm part **57** by bending so as to extend upward. A base end of the long and narrow lever shaped arm part **58***b* that extends in the long side direction of the first housing **11** is connected to the upper end of the main body part **58***a*. The arm part **58***b* functions as a spring member and the tip end thereof, in other words the free end, can be flexibly displaced in the vertical direction. Further, a connecting raised part **58***c* that protrudes upward is formed on the free end of the arm part **58***b*. The upper end of the connecting raised part **58***c* is a part positioned at the upward-most side on the fitting surface side of the first connector **1** when the first reinforcing bracket **51** is attached to the first housing **11**. In addition, the detection circuit that detects the fit completion between the first connector **1** and the second connector **101** closes by conductivity when contacting the detection pad **194** to be described hereinafter formed on the surface of the second board **191**.

The first metal fitting retention recessed part **26** is provided with an outer side end part receptor **26***a* in a groove shape that extends in the width direction and the thickness direction of the first housing **11**, a first arm part receptor **26***b* in a groove shape that extends in the long side direction and in the thickness direction of the first housing **11** and is formed on the side wall extending part **21***b* so as to link with the outer side end part receptor **26***a*, a first lock receiving latch part **26***c* arranged on the end part approaching the center in the long side direction of the first housing **11** in the first arm part receptor **26***b* with the first lock latching part **57***a* latches, and the connecting part receptor opening **26***d* that links with the first arm part receptor **26***b* opens to the outer surface of the side wall extending part **21***b* so that the first board in connecting part **56** or the fit completion detecting part **58** can be viewed from the outside.

Referring in more detail to FIGS. **3**-**4**, the second connector **101** includes a second housing **111** as a connector main body that is integrally formed by an insulating material such as a synthetic resin or the like. The second housing **111**, as illustrated in the drawing, is essentially a rectangular thick board shape that is essentially a rectangular solid, and is provided with dimensions such as approximately 8.0 mm long, approximately 1.5 mm wide, and approximately 0.8 mm thick, and these dimensions can be suitably changed. Further, a long and narrow recessed groove part **113** that extends in the long side direction of the second housing **111** and a long and narrow raised part second ridged part **112** that extends in the long side direction of the second housing **111** are integrally formed on the side in which the first connector **1** of the second housing **111** is inserted, in other words, the fitting surface side (upper side in the drawing) while marking the outside of the recessed groove part **113**. The second ridged part **112** is formed along both sides of the second housing **111** and along both sides of the recessed groove part **113**. In addition, each of the second ridged parts **112** have a second terminal **161** arranged as terminals.

As illustrated in the drawing, the recessed groove part **113** is stopped by the bottom part on the side where it is mounted on the second board **191**. Moreover, although there are two second ridged parts **112** in the example illustrated in the drawing, it can also be singular and there can be any number thereof. In addition, the recessed groove part **113** is provided with a dimension of, for example, 0.7 mm in width, and this dimension can be suitably changed.

The second terminal **161** is a member integrally formed by a working process such as stamping or bending a conductive metal plate, and is provided with a main body part not illustrated in the drawing, a tail part **162** that is connected to the bottom end of the main body part, a first contacting part **165** that is connected to the top end of the main body part, a connecting part **164** that is connected to the top end of the first contacting part **165**, and a second contacting part **166** that is connected to the outer end of the connecting part **164**. Further,

a first contacting recessed part **165***a* that engages with the first contacting part **65** of the first terminal **61** is formed on the surface of the first contacting part **165**, and a second contacting recessed part **166***a* that engages with the second contacting part **66** of the first terminal **61** is respectively formed on the surface of the second contacting part **166**.

Further, the main body part is a part that is held by surrounding the periphery of the second housing **111**, and is a part not illustrated in FIG. **3** and FIG. **4**. Additionally, the tail part **162** is connected to the bottom end that extends in the lateral direction of the main body part, that is to say the width direction of the second housing **111**, and extents outward of the second housing **111**, and is connected by soldering or the like to a terminal connection pad **192** that is linked to a conductive trace on the second board **191**.

Further, in addition to the terminal connection pad **192**, an anchoring pad **193** and a detection pad **194** are formed on the surface of the second board **191**. Each of the terminal connection pads **192** are linked to a conductive trace not illustrated that correspond to each of the second terminals **161**. In addition, each of the detection pads **194** are linked to a conductive trace of a detection circuit not illustrated to detect the fit completion between the first connector **1** and the second connector **101**. In addition, the anchoring pad **193** is not necessarily linked to a conductive trace but is linked to a conductive trace that functions as, for example, a ground line when using the second reinforcing bracket **151** to function as a ground terminal or the like.

Further, the first contacting part **165** is connected to the main body part and is a part in a flat plate shape that extends in the vertical direction, that is to say the thickness direction, of the second housing **111**. Furthermore, the connecting part **164** is connected by bending in relation to the first contacting part **165** and extends outward in the width direction of the second housing **111**. In addition, the second contacting part **166** is connected by bending downward to the outer end of the connecting part **164** and is a part that extends downward.

The second terminals **161** are integrated with the second housing **111** by over molding. In other words, the second housing **111** is formed by filling resin in the cavity of a mold in which the second terminals **161** are prepared inside in advance. By so doing, the second terminals **161** can be integrally attached to the second housing **111** in a state in which the main body part is embedded within the second housing **111** and the surfaces of the first contacting part **165**, the connecting part **164**, and the second contacting part **166** are exposed to each side surface of the second ridged part **112** as well as to the fitting surface. In this case, the second terminals **161** are arranged, for example, in 16 pieces each at a pitch of approximately 0.4 mm. Moreover, the pitch and number of second terminals **161** can be suitably changed.

In addition, second overhanging end parts **122** are each arranged as second engaging guide parts to both ends in the long side direction of the second housing **111**. The second overhanging end part **122** is a thick member that extends in the width direction of the second housing **111** where both ends are connected to both ends in the long side direction of each second ridged part **112**, and the upper surface thereof provides an essentially rectangular shape. Further, the second overhanging end part **122** functions as an inserting ridged part when the first overhanging end part **21** provided by the first connector **1** is inserted and when the first connector **1** and the second connector **101** are in a fitted state.

Furthermore, a second reinforcing bracket **151** is attached as a reinforcing metal fitting to the second overhanging end part **122**. The second reinforcing bracket **151** is arranged along the outer side end in the long side direction of the second housing **111** for the second overhanging end part **122** and is received and held within the second metal fitting retention recessed part **126** formed on the second overhanging end part **122**.

The second reinforcing bracket **151** in the present embodiment is a member that is integrally formed by a working process such as punching or bending a conductive metal plate and is provided with a second main body part **152** in the shape of a long and narrow band that extends in the width direction of the second housing **111** as a complete body, a second arm part **157** that is connected by bending to both the left and right ends of the second main body part **152** and extends in the with direction of the second housing **111** and is held to the second housing **111**, a second board connecting part **156** that is connected to the bottom end of the second arm part **157**, and a second locking part **154** that is formed on the second main body part **152**. The second board connecting part **156** functions as a soldering tail part for the second reinforcing bracket **151**, and the bottom surface thereof is formed so as to be nearly parallel with the mounting surface not illustrated of the second housing **111** and is anchored by soldering or the like to an anchoring pad **193** on the second board **191**.

In addition, the second metal fitting detention recessed part **126** is provided with a second main body part receptor **126***a* that is an outer side surface in the long side direction of the second housing **111** in the second overhanging end part **122**, and a second arm part receptor **126***b* that is groove shaped and extends in the width direction and the thickness direction of the second housing **111** and is formed so so as to release to the side surface of the second overhanging end part **122**.

Moreover, the second reinforcing bracket **151** received in its near entirety within the second metal fitting retention recessed part **126** when attached to the second overhanging end part **122**, and the outer side surface in the long side direction of the second housing **111** in the second main body part **152** is exposed to the outer side surface in the long side direction of the second housing **111** in the second overhanging end part **122**, and the lower surface of the second board connecting part **156** is exposed to the mounting surface of the second housing **111**. Further, the second locking part **154** engages with the first locking part **54** of the first reinforcing bracket **51** provided by the first connector **1** when the first connector **1** and the second connector **101** are in a fitted state.

Referring to FIGS. **5-9**, the first connector **1** is surface mounted on the first board with the tail part **62** of the first terminals **61** being connected by soldering or the like to the terminal connection pad that is linked to a conductive trace on the first board not illustrated in the drawing while the first board connecting part **56** of the first reinforcing bracket **51** is connected by soldering or the like to the anchoring pad on the first board, and the lower end surface of the main body part **58***a* in the fit completion detecting part **58** of the first reinforcing bracket **51** is connected by soldering or the like to the detection pad. Moreover, the first board is omitted from the drawing for convenience in the explanation.

Further, the second connector **101** is surface mounted on the second board **191** with the tail part **162** of the second terminals **161** being connected by soldering or the like to the terminal connection pad **192** that is linked to a conductive trace on the second board **191**, and the second board connecting part **156** of the second reinforcing bracket **151** is connected by soldering or the like to the anchoring pad **193** of the second board **191**.

First, the operator, as illustrated in FIG. **5**, puts the fitting surface of the first connector **1** and the fitting surface of the second connector **101** into opposing dispositions, and when the position of the left and right second ridged parts **112** of the

second connector **101** matches the positions of the left and right recessed groove parts **12***a* of the first connector **1**, the position matching is complete between the first connector **1** and the second connector **101**.

In this state, when moving the first connector **1** and/or the second connector **101** in the direction that approaches the other, and other words in a fitting direction, as illustrated in FIG. **6**, the left and right second ridged parts **112** of the second connector **101** are inserted into the left and right recessed groove parts **12***a* of the first connector **1**. Further, the second terminals **161** of the second connector of **101** are inserted between the first contacting parts **65** and the second contacting parts **66** of each of the first terminals **61**, and the first contacting parts **65** of the first terminals **61** contact with the first contacting parts **165** of the second terminals **161** and the second contacting parts **66** of the first terminals **61** contact with the second contacting parts **166** of the second terminals **161**.

In the state illustrated in FIG. **6**, the first contacting part **65** of the first terminals **61** contact the surface of the first contacting part **165** of the second terminals **161**, and the second contacting part **66** of the first terminals **61** contact the surface of the second contacting part **166** of the second terminals **167**. By so doing, the gap between the first contacting part **65** and the second contacting part **66** in the first terminals **61** is widened by the second terminals **161** to flexibly elongate. Moreover, with the second terminals **161**, the gap between the first contacting part **165** and the second contact in part **166** undergoes virtually no deformation. Further, the connecting raised part **58***c* of the fit completion detecting part **58** does not contact the detection pad **194** of the second board **191**.

Next, when the operator further moves the second connector **101** relatively in the fitting direction in relation to the first connector **1**, the fit between the first connector **1** and the second connector **101** is complete, and as illustrated in FIG. **7**, the first contacting part **65** of the first terminals **61** engage with the first contacting recessed part **165***a* of the second terminals **161**, and the second contacting part **66** of the first terminals **61** is in an engaged state with the second contacting recessed part **166***a* of the second terminals **161**.

As a result, there is conductivity with the conductive trace connected to the terminal connection pad on the first board where the tail part **62** of the first terminal **61** is connected, and with the conductive trace connected to the terminal connection pad **192** on the second board **191** where the tail part **162** of the second terminal **161** is connected.

Further, a locked state occurs in which the first reinforcing bracket **51** provided by the first connector **1** and the second reinforcing bracket **151** provided by the second connector **101** mutually engage. As a result, the first connector **1** and the second connector **101** are locked.

In addition, the connecting raised part **58***c* of the fit completion detecting part, as illustrated in FIGS. **7** and **9**, has conductivity by the upper end thereof contacting the detection pad **194** of the second board **191**. As a result, the detection circuit for detecting the fit completion between the first connector **1** and the second connector **101** closes, and the fit completion between the first connector **1** and the second connector **101** is electrically detected. In other words, the fit completion detecting part **58** and the detection pads **194** function as a switching member for a fit completion detection switch.

Further, the timing for conductivity for when the connecting raised part **58***c* of the fit completion detecting part **58** contacts the detection pads **194** of the second board **191** is after the first contacting part **65** of the first terminals **61** complete engagement with the first contacting recessed part **165***a* of the second terminals **161** and after the second contacting part **66** of the first terminals **61** complete engagement with the second contacting recessed part **166***a* of the second terminals **161**. In other words, the configuration is such that while the first contacting part **65** of the first terminals **61** contact the surface of the first contacting part **165** of the second terminals **161** but has still not yet entered into the first contacting recessed part **165***a*, or while the second contacting part **66** of the first terminals **61** contacts the surface of the second contacting part **166** of the second terminals **161** but has still not yet entered into the second contacting recessed part **166***a*, the connecting raised part **58***c* of the fit completion detecting part **58** does not contact the detection pad **194** of the second board **191** and fit completion between the first connector **1** and the second connector **101** is not detected.

The detection circuit is configured so that, for example, a conductive trace formed on the surface of the second board **191** and linked to the detection pads **194**, and a conductive trace formed on the surface of the first board not illustrated and linked to the anchoring pads anchored by the first reinforcing bracket **51** connected to both terminals of a testing device similar to a tester for testing the conductivity state of electric circuits. By so doing, when when there is conductivity by the connecting raised part **58***c* of the fit completion detecting part **58** contacting the detection pad **194** of the second board **191**, that is to say the switch for fit completion detection is switched on, the detection circuit closes and the state of conductivity is detected by the testing device.

Furthermore, when bowing or warpage occurs in the first board not illustrated or the second board **191**, as illustrated in FIG. **7**, even though the first contacting part **65** of the first terminals **61** engages with the first contacting recessed part **165***a* of the second terminals **161**, and the second contacting part **66** of the first terminals **61** is in an engaged state with the second contacting recessed part **166***a* of the second terminals **161**, the connecting raised part **58***c* of the fit completion detecting part **58** does not contact the detection pad **194** of the second board **191** so there are times in which the fit completion between the first connector **1** and a the second connector **101** cannot be electrically detected.

At such a time, the operator further moves the second connector **101** relatively in the fitting direction in relation to the first connector **1** from the state illustrated in FIG. **7**, and the connecting raised part **58***c* of the fit completion detecting part **58** contacts the detection pad **194** of the second board **191** to make conductivity by establishing the state illustrated in FIG. **8**, and the fit completion between the first connector **1** and the second connector **101** is electrically detected.

When establishing the state illustrated in FIG. **8**, because the upper surface of the first ridged part **13** of the first housing **11** contacts the bottom surface of the recessed groove part **113** of the second housing **111**, further movement by the second connector **101** in the fitting direction in relation to the first connector **1** is prevented. In other words, the first ridged part **13** of the first housing **11** and the recessed groove part **113** of the second housing **111** functions as a stopper to prevent more than necessary relative movement in the fitting direction of the second connector **101** in relation to the first connector **1**. By so doing, because the second connector **101** is not pushed in more than is necessary, in other words more than the state illustrated in FIG. **8**, in relation to the first connector **1**, members such as the first terminal **61**, the second terminal **161**, and so forth are prevented from receiving damage.

In addition, because the connecting ridged part **58***c* of the fit completion detecting part **58** can flexibly displace in a vertical direction due to the arm part **58***b* functioning as a spring member, even if the second connector **101** moves

further in the relative fitting direction in relation to the first connector **1** from the state illustrated in FIG. **7**, the conductive state with the detection pad **194** of the second board **191** can be maintained. In addition, the detection pad **194** and the connecting ridged part **58***c* do not receive any damage.

Thereby, when the fit between the first connector **1** and the second connector **101** is complete, the first terminal **61** and the second terminal **161** are in a state of conductivity. More specifically, the first contacting part **65** of the first terminal **61** engages with the first contacting recessed part **165***a* of the second terminal **161** to create an engaged state between the second contacting part **66** of the first terminal **61** and the second contacting recessed part **166***a* of the second terminal **161**. As a result, there is conductivity with the conductive trace connected to the terminal connection pad on the first board where the tail part **62** of the first terminals **61** are connected, and with the conductive trace connected to the terminal connection pad **192** on the second board **191** where the tail part **162** of the second terminals **161** are connected. In this case, because the first terminals **61** and the second terminals **161** are contacting at multiple points, the state of conductivity can be security maintained.

Further, a locked state occurs in which the first reinforcing bracket **51** provided by the first connector **1** and the second reinforcing bracket **151** provided by the second connector **101** mutually engage. In this case, the first locking part **54** of the first reinforcing bracket **51** which is a ridged part enters into the second locking part **154** of the second reinforcing bracket **151** which is an open part so that the first locking part **54** and the second locking part **154** mutually engage thereby locking the first connector **1** and the second connector **101**.

In addition, the description given in the present embodiment included the fit completion detecting part **58** of the first reinforcing bracket **51** and the detection pad **194** of the second board **191** functioning as switching members of a switch for fit completion detection, but a configuration is also possible in which a detection pad similar to the detection pad **194** can be formed on the first board and a portion of the first reinforcing bracket **51** can be made to contact such detection pad thereby enabling a switch for fit completion detection. In other words, as long as at least one from among a plurality of switching members capable of mutual contact included with the switch is the first reinforcing bracket **51** or the second reinforcing bracket **151**, it is acceptable.

In addition, a description was provided only for the case in which the detection pad **194** did not displace with the connecting ridged part **58***c* of the fit completion detecting part **58** having the ability to flexibly displace in the fitting direction, but it may also be a portion of the detection pad **194** (for example the surface) that has the ability for flexible displacement in the fitting direction. In other words, as long as at least one from among a plurality of switching members capable of mutual contact included with the switch has the ability for flexible displacement in the fitting direction, it is acceptable.

In this manner, because in the present embodiment the first connector **1** and the second connector **101** are configured so as to electrically detect the fit completion, the fit completion between the first connector **1** and the second connector **101** can be accurately confirmed without the operator seeing, feeling with his hand, hearing a click sound, or the like, or in other words relying on the five senses of the operator. Accordingly, a board-to-board connector with high reliability can be provided that can securely prevent the occurrence of incomplete fitting in a fitting process even when fit completion is difficult to confirm by an operator seeing, feeling with his hand, hearing a click sound, or the like, when the first connector **1** and the second connector **101** have a small size and low height.

Furthermore, the first reinforcing bracket **51** in the present embodiment, in addition to improving the original mounting strength of the first connector **1** on the first board, also provides the locking function with the second connector **101** and is used as a part of the detection circuit for detecting the fit completion. Therefore, because it is not necessary to attach a member for detecting the fit completion to the first connector **1** and the second connector **101**, increasing the size and the number of components in the first connector **1** or the second connector **101** can be prevented. In addition, because the first terminals **61** or the second terminals **161** are not used in the detection circuit, the number of terminals or the number of poles are essentially not reduced.

In addition, in the present embodiment, a pair of fit completion detecting parts **58** are placed on a diagonal line of the first connector **1** as viewed from the fitting surface side, and a pair of detection pads **194** are placed on a diagonal line of the second connector **101** making it difficult to be affected by bowing or warpage in the first board or the second board **191**, and therefore the fit completion between the first connector **1** and the second connector **101** can be securely detected. Further, even if bowing or warpage occurs in the first board or the second board **191**, the fit completion can be detected by further moving the first connector **1** or the second connector **101** relatively in the fitting direction as described above.

Referring to FIGS. **10-11**, the first reinforcing bracket **51** of the first connector **1** in the present embodiment separates the flexible part **51**R positioned to the right side from the rigid part **51**L positioned to the left side as illustrated in FIG. **12** and FIG. **14** to be described below. Further, the flexible part **51**R and the rigid part **51**L, respectively, are members integrally formed by a working process such as punching or bending a conductive metal plate, and are provided with a first main body part **52**, a first arm part **57** connected to the first main body part **52** and held to the first housing **11**, and a first board connecting part **56** connected to the lower end of the first on part **57**. Note, neither the flexible part **51**R nor the rigid part **51**L are provided with a first locking part **54**.

Further, the first board connecting part **56** functions as a soldering tail part for the flexible part **51**R and the rigid part **51**L, and the bottom surface thereof is formed so as to be nearly parallel with the mounting surface of the first housing **11** and is anchored by soldering or the like to an anchoring pad on the first board not illustrated.

Additionally, the flexible part **51**R is connected to the lower end of the first main body part **52** and is provided with a flexible fit completion detecting part **58**R that extends in the direction of the rigid part **51**L; and the rigid part **51**L is connected to the lower end of the first main body part **52** and is provided with a rigid fit completion detecting part **58**L that extends in the direction of the flexible part **51**R. The rigid fit completion detecting part **58**L and the flexible fit completion detecting part **58**R extend along the bottom surface of the first metal fitting retention recessed part **26** of the first housing **11**.

The rigid fit completion detected part **58**L is a long and narrow flat plate shaped member that extends directly along the bottom surface of the first metal fitting retention recessed part **26** or the mounting surface of the first housing **11** to be described hereinafter as illustrated in FIG. **12**. In contrast to this, the flexible fit to completion detecting part **58**R is provided with a main body part **58**Ra that is a long and narrow flat plate shaped part that extends directly along the bottom plane of the first metal fitting retention recessed part **26** or the mounting service of the first housing **11**, and an arm part

58Rb with a long and narrow cantilever shape that extends upward at a slant toward the fitting surface of the first housing **11** from the tip end of the main body part **58**Ra. The arm part **58**Rb functions as a spring member and the tip end thereof, in other words the free end, can be flexibly displaced in the vertical direction. As illustrated in FIG. **10**, when in a state in which the second connector **101** is not engaged with the first connector **1**, the free end of the arm part **58**Rb is positioned further to the fitting surface side then the upper surface of the rigid fit completion detecting part **58**L. In other words, it is positioned further above than the upper surface of the rigid fit completion detecting part **58**L.

Further, with the example illustrated in the drawings, the flexible fit completion detecting part **58**R is formed to be longer than the rigid fit completion detecting part **58**L, and either the tip end of the flexible fit completion detecting part **58**R or the tip end of the rigid fit completion detecting part **58**L resides within the range from the end of the rigid part **51**L in the width direction of the first housing **11** until the center part.

Furthermore, the second reinforcing bracket **151** of the second connector **101** in the present embodiment is a member that is integrally formed by a working process such as punching or bending a conductive metal plate and is provided with, as illustrated in FIG. **12** to be described hereinafter, a second main body part **152** in the shape of a long and narrow band that extends in the width direction of the second housing **111** as a complete body, and a second board connecting part **156** that is connected to both the left and right ends of the second main body part **152** and that extends toward the mounting surface. Note, in the present embodiment, the second reinforcing bracket **151** is not provided with a second locking part **154**.

The second reinforcing bracket **151** is integrated with the second housing **111** by over molding. In other words, the second housing **111** is formed by filling resin in the cavity of a mold in which the second reinforcing bracket **151** is prepared inside in advance. By so doing, the second reinforcing bracket **151** can be integrally attached to the second housing **111** in a state in which the majority of the second main body part **152** is embedded within the second housing **111** and the upper end part of the second main body part **152** is exposed to the fitting surface, and the lower end part of the second board connecting part **156** is exposed to the mounting surface.

Further, the second board connecting part **156** functions as a soldering tail part for the second reinforcing bracket **151**, and the bottom surface thereof is formed so as to be nearly parallel with the mounting surface of the second housing **111** and is anchored by soldering or the like to an anchoring pad **193** on the second board **191**.

Further, the second fit completion detecting part **158** is integrally formed on the upper end part of the second main body part **152** so as to further protrude from the upper end surface thereof. The second fit completion detecting part **158**, in the example illustrated in the drawing, is formed on the upper side surface of the second main body part **152** within the range from one end of the width direction of the second housing **111** until the center part, which more specifically is a range that is approximately either the right half or the left half of the upper end surface of the second main body part **152**.

In the state in which the first connector **1** has completed engagement with the second connector **101**, the upper end surface of the second fit completion detecting part **158** is the portion that has conductivity by contacting with the upper surface of the rigid fit completion detecting part **58**L and the flexible fit completion detecting part **58**R. Accordingly, the second fit completion detecting part **158** is formed within a range that is approximately half of the side that corresponds to the range in which the tip end of the rigid fit completion detecting part **58**L and the flexible fit the completion detecting part **58**R are positioned in the first connector **1** has the other connector. Moreover, the dimensions in regards to the width direction of the second housing **111** of the second fit completion detecting part **158** are not required to always be approximately half of the upper end surface of the second main body part **152** as in the example illustrated in the drawing, but may be shorter or may be longer than that.

In the present embodiment, the detection circuit is configured so that a conductive trace is formed on the surface of the first board not illustrated where the first board connecting part **56** of the flexible part **51**R is linked to a fixed anchoring pad, and a conductive trace where the first board connecting part **56** of the rigid part **51**L is linked to a fixed anchoring pad, by connecting to both terminals of a testing device similar to a tester for testing the conductivity state of the electric circuits. By so doing, when conductivity occurs by the upper surface of the rigid fit completion detecting part **58**L and the flexible fit completion detecting part **58**R of the first connector **1** contacting the upper end surface of the second fit completion detecting part **158** of the second connector **101**, the detection circuit closes and the conductivity state is detected by the testing device and thus the fit completion between the first connector **1** and the second connector **101** is electrically detected. In other words, in the present embodiment, the second fit completion detecting part **158** together with the rigid fit completion detecting part **58**L and the flexible fit completion detecting part **58**R function as a switching member for a fit completion detection switch.

Note, the present embodiment does not require that the detection pad **194** be formed on the second board **191**. Further, in the present embodiment, other points of configuration are the same as the first embodiment, and therefore descriptions thereof are omitted.

Referring to FIGS. **12-4**, the first connector **1** is surface mounted on the first board with the tail part **62** of the first terminals **61** being connected by soldering or the like to the terminal connection pad **192** that is linked to a conductive trace on the first board not illustrated, and the first board connecting part **56** of the rigid part **51**L and the flexible part **51**R is connected by soldering or the like to the anchoring pad of the first board. Moreover, the first board is omitted from the drawing.

Further, the second connector **101** is surface mounted on the second board **191** with the tail part **162** of the second terminals **161** being connected by soldering or the like to the terminal connection pad **192** that is linked to a conductive trace on the second board **191**, and the second board connecting part **156** of the second reinforcing bracket **151** is connected by soldering or the like to the anchoring pad **193** of the second board **191**. Note, the present embodiment omits the second board **191** from the drawing.

First, the operator, in a similar manner to the first embodiment, positions the first connector **1** and the second connector **101** to make a state in which the fitting surface of the first connector **1** faces the fitting surface of the second connector **101** then moves the first connector **1** and/or a second connector **101** in a direction to approach the side of the other, that is to say the fitting direction.

By so doing, the left and right second ridged parts **112** of the second connector **101** are inserted into the left and right recessed groove parts **12***a* of the first connector **1**. Further, the second terminals **161** of the second connector of **101** are inserted between the first contacting parts **65** and the second contacting parts **66** of each of the first terminals **61**, and the

first contacting parts **65** of the first terminals **61** contact with the surfaces of the first contacting parts **165** of the second terminals **161** and the second contacting parts **66** of the first terminals **61** contact with the surfaces of the second contacting parts **166** of the second terminals **161**. By so doing, the gap between the first contacting part **65** and the second contacting part **66** in the first terminals **61** is widened by the second terminals **161** to flexibly elongate. Further, as illustrated in FIG. **12**, the upper surface of the rigid fit completion detecting part **58**L and the upper surface of the flexible fit completion detecting part **58**R of the first connector **1** does not contact the upper end surface (the lower end surface in FIG. **12**) of the second fit completion detecting part **158** of the second connector **101**.

Next, when the operator further moves the second connector **101** relatively in the fitting direction in relation to the first connector **1**, the fit between the first connector **1** and the second connector **101** is complete, and as illustrated in FIG. **13**, the first contacting part **65** of the first terminals **61** engage with the first contacting recessed part **165***a* of the second terminals **161**, and the second contacting part **66** of the first terminals **61** is in an engaged state with the second contacting recessed part **166***a* of the second terminals **161**.

As a result, there is conductivity with the conductive trace connected to the terminal connection pad on the first board where the tail part **62** of the first terminal **61** is connected, and with the conductive trace connected to the terminal connection pad **192** on the second board **191** where the tail part **162** of the second terminal **161** is connected.

In addition, as illustrated in FIG. **14**, the upper surface of the rigid fit completion detecting part **58**L and the upper surface of the flexible fit completion detecting part **58**R of the first connector **1** contacts with the upper end surface of the second fit completion detecting part **158** of the second connector **101** to create conductivity. In other words, the switch for fit completion detection is turned on. Furthermore, the detection circuit for detecting the fit completion between the first connector **1** and the second connector **101** closes, and the fit completion between the first connector **1** and the second connector **101** is electrically detected.

When establishing the state illustrated in FIG. **14**, because the upper end surface of the second fit completion detecting part **158** contacts the upper surface of the rigid fit completion detecting part **58**L, further movement by the second connector **101** in the fitting direction in relation to the first connector **1** is prevented. In other words, the rigid fit completion detecting part **58**L and the second fit completion detecting part **158** function as a stopper to prevent more than necessary relative movement in the fitting direction of the second connector **101** in relation to the first connector **1**. By so doing, because the second connector **101** is not pushed in more than is necessary, in other words more than the state illustrated in FIG. **14**, in relation to the first connector **1**, members such as the first terminal **61**, the second terminal **161**, and so forth are prevented from receiving damage.

Further, the timing for conductivity for when the upper end surface of the second fit completion detecting part **158** contacts the rigid fit completion detecting part **58**L is after the first contacting part **65** of the first terminals **61** complete engagement with the first contacting recessed part **165***a* of the second terminals **161** and after the second contacting part **66** of the first terminals **61** complete engagement with the second contacting recessed part **166***a* of the second terminals **161**. In other words, the configuration is such that while the first contacting part **65** of the first terminals **61** contact the surface of the first contacting part **165** of the second terminals **161** but has still not yet entered into the first contacting recessed part **165***a*, or while the second contacting part **66** of the first terminals **61** contacts the surface of the second contacting part **166** of the second terminals **161** but has still not yet entered into the second contacting recessed part **166***a*, the upper end surface of the second fit completion detecting part **158** does not contact the rigid fit completion detecting part **58**L and fit completion between the first connector **1** and the second connector **101** is not detected.

Therefore, the upper end surface of the second fit completion detecting part **158**, and particularly the location where it contacts the rigid fit completion detecting part **58**L, requires that higher dimension accuracy be provided over the other parts of the second main body part **152**. Note, the location where the rigid fit completion detecting part **58**R is contacted can have a low degree of dimensional accuracy because the flexible fit completion detecting part **58**R can flexibly displace.

Further, the description provided in the present embodiment is for when the rigid fit completion detecting part **58**L and the second fit completion detecting part **158** function as a stopper, however as long as at least one from among a plurality of switching members with the ability for mutual contact included in the switch and function as a stopper, it is acceptable.

Because the first reinforcing bracket **51** and the second reinforcing bracket **151** are used as a part of the detection circuit for detecting fit a completion in this manner in the present embodiment, it is not necessary to attach a member for detecting the fit completion to the first connector **1** and the second connector **101**, and increasing the size and the number of components in the first connector **1** or the second connector **101** can be prevented. In addition, because the first terminals **61** or the second terminals **161** are not used in the detection circuit, the number of terminals or the number of poles are essentially not reduced. In addition, because the detection pad **194** does not need to be formed on the second board **191** as in the first embodiment, the configuration of the second board **191** can be simplified. Additionally, because the second board **191** is not included as a part of the detection circuit as in the first embodiment, the configuration of the detection circuit can be further simplified.

Further, in the present embodiment, a pair of second fit completion detecting parts **158** is placed on a diagonal line of the second connector **101** as viewed from the fitting surface side, and the tip ends of the rigid fit completion detecting part **58**L and the flexible fit completion detecting part **58**R that contact the second fit completion detecting part **158** are placed on a diagonal line of the first connector **1** as viewed from the fitting surface side, thus making it difficult to be affected by bowing or warpage in the first board or the second board **191**, and therefore the fit completion between the first connector **1** and the second connector **101** can be securely detected.

The effect of other points are the same as the first embodiment, therefore descriptions thereof are omitted.

Referring to FIGS. **15-6**, the first reinforcing bracket **51** of the first connector **1** in the present embodiment is not provided with the fit completion detecting part **58**, and the first board connecting part **56** is connected to the lower ends of both of the left and right first arm parts **57**. With regard to the other points, the configuration of the first reinforcing bracket **51** in the present embodiment is similar to the first reinforcing bracket **51** in the first embodiment.

Further, the first connector **1** in the present embodiment has a fit completion detecting terminal **71** as the fit completion detecting part in place of one of the first terminals **61**. In the example illustrated in FIG. **15**, the fit completion detecting

terminal **71** is arranged in place of the first terminal **61** that corresponds to the first terminal receptacle cavity **15** positioned at the right upper end in the example of the first terminal receptacle cavity **15** formed on the left side of the first housing number **11**.

The fit completion detecting terminal **71** is a member integrally formed by a working process such as stamping or bending a conductive metal plate, and is provided with, as illustrated in FIGS. **17** to **20** to be described hereinafter, a retention receiving part **73**, a tail part **72** connected to the lower end of the retention receiving part **73**, an upper side connecting part **77** connected to the upper end of the retention receiving part **73**, a side surface connecting part **76** formed in the vicinity of the inward end of the upper side connecting part **77**, and a fit completion detecting part **75** connected to the lower end of the side surface connecting part **76**.

Further, the retention receiving part **73** extends in a vertical direction, that is to say the thickness direction, of the first housing **11** and is a part that is engaged and held with the first terminal receptacle outer side cavity **15***b*. In addition, the tail part **72** is connected by bending in relation to the retention receiving part **73**, and extends outward in the width direction of the first housing **11**, and is connected by soldering or the like to a terminal connection pad that is linked to a conductive trace on the first board. Furthermore, the upper side connecting part **77** is connected by bending in relation to the retention receiving part **73** and extends inward in the width direction of the first housing **11**.

The side surface connecting part **76** that extends downward is connected to the inner end of the upper side connecting part **77**, and the fit completion detecting part **75** with a cantilever shape that extends at a slant upward as well as extending inward in the width direction of the first housing **11** is connected to the lower end of the side surface connecting part **76**. The fit completion detecting part **75** functions as a spring member and the tip end thereof, in other words the entire body including the free end, can be flexibly displaced in the vertical direction.

The fit completion detecting terminal **71** is inserted into the first terminal receptacle cavity **15** from the mounting surface side (lower side in the drawing), and is anchored to the first housing **11** by being held from both sides by the side walls of the first terminal receptacle outer side cavities **15***b* where the retention receiving part **73** is formed to the side surface of the inner side of the side wall part **14**. In this state, and other words the state in which the fit completion detecting terminal **71** is loaded on the first housing **11**, the side surface connecting part **76** stops within the first terminal receptacle outer side cavity **15***b* and is not exposed within the recessed groove part **12***a*. Meanwhile, the fit completion detecting part **75** his position to the lower side within the recessed groove part **12***a*.

Further, other points of configuration with the first connector **1** are the same as the first embodiment, and therefore descriptions thereof are omitted. Further, the configuration of the second connector **101** in the present embodiment is the same as the first embodiment, and therefore descriptions thereof are omitted.

However, in the present embodiment, the detection circuit for detecting the fit completion between the first connector **1** and the second connector **101** is configured so that a conductive trace formed on the surface of the first board not illustrated where the tail part **72** of the fit completion detecting terminal **71** is linked to the connected terminal connection pad on the first board not illustrated, and a conductive trace with the tail part **162** of the second terminal **161** is linked to the connected terminal connection patent **192** on the second board **191**, by connecting to both terminals of a testing device similar to a tester for testing the conductive a state of the electric circuits. By so doing, when conductivity occurs by the second terminal **161** that corresponds to the fit completion detecting terminal **71** contacting the fit the completion detecting terminal **71**, the detection circuit closes and the conductivity state is detected by the testing device and thus the fit completion between the first connector **1** and the second connector **101** is electrically detected. In other words, in the present embodiment, the fit completion detecting terminal **71** and the second terminal **161** that corresponds to the fit completion detecting terminal **71** functions as a switching member for a fit completion detection switch.

Referring to FIGS. **17-20**, the first connector **1** is surface mounted on the first board with the tail part **62** of the first terminals **61** and the tail part **72** of the fit completion detect internal **71** and is connected by soldering or the like to the terminal connection pad that is linked to a conductive trace on the first board not illustrated in the drawing while the first board connecting part **56** of the first reinforcing bracket **51** is connected by soldering or the like to the anchoring pad on the first board.

Further, the second connector **101** is surface mounted on the second board **191** with the tail part **162** of the second terminals **161** being connected by soldering or the like to the terminal connection pad **192** that is linked to a conductive trace on the second board **191**, and the second board connecting part **156** of the second reinforcing bracket **151** is connected by soldering or the like to the anchoring pad **193** of the second board **191**. Note, the present embodiment omits the second board **191** from the drawing.

First, the operator, as illustrated in FIG. **17**, positions the first connector **1** and the second connector **101** to make a state in which the fitting surface of the first connector **1** faces the fitting surface of the second connector **101** in a similar manner to the first embodiment, then moves the first connector **1** and/or a second connector **101** in a direction to approach the side of the other, that is to say the fitting direction.

By so doing, the left and right second ridged parts **112** of the second connector **101** are inserted into the left and right recessed groove parts **12***a* of the first connector **1**. Further, the second terminals **161** of the second connector of **101** are inserted between the first contacting parts **65** and the second contacting parts **66** of each of the first terminals **61**, and the first contacting parts **65** of the first terminals **61** contact with the surfaces of the first contacting parts **165** of the second terminals **161** and the second contacting parts **66** of the first terminals **61** contact with the surfaces of the second contacting parts **166** of the second terminals **161**. By so doing, the gap between the first contacting part **65** and the second contacting part **66** in the first terminals **61** is widened by the second terminals **161** to flexibly elongate. Furthermore, as illustrated in FIG. **18**, the fit completion detecting terminal **71** of the first connector **1** does not contact the second terminal **161**.

Next, when the operator further moves the second connector **101** relatively in a fitting direction in relation to the first connector **1**, as illustrated in FIG. **19**, the first contacting part **65** of the first terminals **61** enter into the first contacting recessed part **165***a* of the second terminals **161**, and the first contacting part **65** is in an engaged state with the first contacting recessed part **165***a*. However, in the state illustrated in FIG. **19**, the second contacting part **66** of the first terminals **61** contacts the surface of the second contacting part **166** of the second terminals **161** but but without yet entering into the second contacting recessed part **166***a* so the second contact you part **66** and the second contacting recessed part **166***a* do not engage. In such a state, the fit completion detecting ter-

minal **71** of the first connector **1** has not yet contacted the second terminal **161**. In other words, the fit completion between the first connector **1** and the second connector **101** is not detected.

Next, when the operator further moves the second connector **101** relatively in a fitting direction in relation to the first connector **1**, the fit between the first connector **1** and the second connector **101** is complete, and as illustrated in FIG. **20**, the first contacting part **65** of the first terminals **61** engage with the first contacting recessed part **165***a* of the second terminals **161**, and the second contacting part **66** of the first terminals **61** is in an engaged state with the second contacting recessed part **166***a* of the second terminals **161**.

As a result, there is conductivity with the conductive trace connected to the terminal connection pad on the first board where the tail part **62** of the first terminal **61** is connected, and with the conductive trace connected to the terminal connection pad **192** on the second board **191** where the tail part **162** of the second terminal **161** is connected.

Further, a locked state occurs in which the first reinforcing bracket **51** provided by the first connector **1** and the second reinforcing bracket **151** provided by the second connector **101** mutually engage. As a result, the first connector **1** and the second connector **101** are locked.

Additionally, as illustrated in FIG. **20**, conductive itty occurs when the lower surface of the connecting part **164** in the second terminal **161** of the second connector **101** contacts the upper surface of the fit completion detecting part **75** in a fit completion detecting terminal **71** of the first connector **1**. In other words, the switch for fit completion detection is turned on. Further, the detection circuit for detecting the fit completion between the first connector **1** and the second connector **101** closes, and the fit completion between the first connector **1** and the second connector **101** is electrically detected.

Further, when establishing the state illustrated in FIG. **20**, because the upper surface of the first ridged part **13** of the first housing **11** contacts the bottom surface of the recessed groove part **113** of the second housing **111**, further movement by the second connector **101** in the fitting direction in relation to the first connector **1** is prevented. In other words, the first ridged part **13** of the first housing **11** and the recessed groove part **113** of the second housing **111** function as a stopper to prevent more than necessary relative movement in the fitting direction of the second connector **101** in relation to the first connector **1**. By so doing, because the second connector **101** is not pushed in more than is necessary, in other words more than the state illustrated in FIG. **20**, in relation to the first connector **1**, members such as the first terminal **61**, the second terminal **161**, and so forth are prevented from receiving damage.

Further, the timing for conductivity for when the lower surface of the connecting part **164** contacts the upper surface of the fit completion detecting part **75** is after the first contacting part **65** of the first terminals **61** complete engagement with the first contacting recessed part **165***a* of the second terminals **161** and after the second contacting part **66** of the first terminals **61** complete engagement with the second contacting recessed part **166***a* of the second terminals **161**. In other words, the configuration is such that while the first contacting part **65** of the first terminals **61** contact the surface of the first contacting part **165** of the second terminals **161** but has still not yet entered into the first contacting recessed part **165***a*, or while the second contacting part **66** of the first terminals **61** contacts the surface of the second contacting part **166** of the second terminals **161** but has still not yet entered into the second contacting recessed part **166***a*, the lower surface of the connecting part **164** does not contact the upper surface of the fit completion detecting part **75** and fit completion between the first connector **1** and the second connector **101** is not detected.

In addition, the fit completion detecting part **75** in the fit completion detecting terminal **71** can flexibly displace in a vertical direction functioning as a spring member, and even if the second connector **101** is displaced in the relative fitting direction in relation to the first connector **1** from the state illustrated in FIG. **20**, the conductive state with the detection pad **194** of the second board **191** can be maintained.

Because the fit completion detecting terminal **71** is attached to the first connector **1** in place of one of the first terminals **61**, and because the fit completion detecting terminal **71** and the second terminal **161** corresponding thereto are used as a part of the detection circuit for detecting the fit completion in this manner in the present embodiment, increasing the size and the number of components in the first connector **1** or the second connector **101** can be prevented. In addition, because the detection pad **194** does not need to be formed on the second board **191** as in the first embodiment, the configuration of the second board **191** can be simplified.

The effect of other points are the same as the first embodiment, therefore descriptions thereof are omitted.

While a preferred embodiment of the Present Disclosure is shown and described, it is envisioned that those skilled in the art may devise various modifications without departing from the spirit and scope of the foregoing Description and the appended Claims.

What is claimed is:

1. A board-to-board connector, the board-to-board connector comprising:

a first connector, the first connector including a first terminal and a first housing, the first housing including a recessed portion and a first reinforcing bracket equipped thereon;

a second connector, the second connector including a second terminal and a second housing, the second terminal contacting the first terminal, the second housing including a raised portion and a second reinforcing bracket equipped thereon, the raised portion being insertable into the recessed portion; and

a switch configured to detect completion of mating of the first connector and the second connector together, the switch including a plurality of switch members, each switch member having the ability to contact another switch member, one of the first and second reinforcing brackets including one of the switch members, and wherein one of the switch members functions as a stop to limit displacement in the mating direction of the first and second connectors.

2. The board-to-board connector of claim **1**, wherein one of the first terminal or second terminal includes a contacting recessed part and the other includes a contacting raised part.

3. The board-to-board connector of claim **2**, wherein, when the contacting recessed part and the contacting raised part engage, the switch detects the completion of mating of the first connector and the second connector together.

4. The board-to-board connector of claim **1**, wherein at least one switch member flexibly displaces in the mating direction of the first connector and the second connector.

5. The board-to-board connector of claim **4**, wherein one of the first terminal or second terminal includes a contacting recessed part and the other includes a contacting raised part.

6. The board-to-board connector of claim **5**, wherein, when the contacting recessed part and the contacting raised part engage, the switch detects the completion of mating of the first connector and the second connector together.

7. A board-to-board connector assembly, comprising:

a first connector, the first connector including an insulative connector housing and a plurality of conductive first terminals supported by the first connector housing, the first housing including a receptacle portion, the first connector further including a first reinforcing bracket supported by the first connector housing;

a second connector, the second connector including an insulative connector housing, mateable with the first connector housing, and a plurality of conductive second terminals supported by the second connector housing, the second housing including a plug portion which is insertable into the first connector housing receptacle portion, the second connector further including a second reinforcing bracket supported by the second connector housing; and,

a switch for configured to detect complete mating of the first and second connectors together, the switch including at least one switch member disposed on one of the first and second reinforcing brackets which flexibly displaces in the mating direction to contact another switch member.

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